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Specification and Procurement of Engineering Materials

Methods employed at the Bullard Plant

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In this second article on the choice of manufacturing materials, it is shown how the purchasing agent is an important factor in co-ordinating incoming information with the engineering and production requirements, and then acting as a central agency for effective procurement

At THE PLANT of the Bullard Machine Tool Company, Bridgeport, Conn., the actual procurement of materials is done entirely by the purchasing agent, although the decision as to the material to be used in a given case does not rest with any one man, and generally represents the co-operation of all factors in the organization. Nothing is bought on a price basis as a ruling factor, and before a purchase is made in quantity, the head of the purchasing department assures himself that the engineering department is satisfied that the material will serve its purpose properly, and that the production department is satisfied that the material can be machined and otherwise treated economically. All direct materials are covered by strict engineering specifications. In addition to this, if there is a change in the "direct material" that goes into the product of the plant, which change might affect sales, either favorably or unfavorably, the approval of the management is obtained.

The products of the company consist of a line of standard machine tools usually built around the requirements of the customer's product, but not varying essentially in design, except as improvements are incorporated. It is nevertheless found that an extensive stock of materials must be kept in the raw stock storeroom, and that about 10,000 items are listed for stores control. The direct materials are those which go into the product, and may be either unworked metal, such as steel, pig iron and brass, or they may be finished or partly finished parts, such as steel castings, forgings, bushings, bolts and washers. The second general classification of "indirect materials" includes steel for shop tools, abrasives, sand, oxygen, acetylene, oils, waste, cleaning compounds, finishes, and office supplies. Approximately 360 different kinds and sizes of steels are used in the plant, ranging in price from $0.036 to $5.94 a pound, and as this is the largest single item of materials cost, it receives a proportionate amount of time in selection from all concerned. When a new steel with superior claims comes to the attention of the company through a salesman, trade paper advertising, direct-mail advertising, or through the recommendation of one of the engineering or production staff, the purchasing agent orders samples which are turned over to the standards department for tests. A test of production or endurance qualities, conducted by the standards engineers, is always carried out in the shop, and laboratory tests are used only where specific physical or chemical properties are wanted. If the shop tests prove that the factory product is improved, or that shop costs are lowered, the standards department makes a report and obtains the approval for the change from the engineering and production departments. Records are then changed and purchases made accordingly.

In order to make sure that all materials purchased from various sources of supply, particularly direct materials, are furnished in accordance with specifications, we have a receiving inspection department in

charge of a capable engineer, whose duty it is to check all shipments upon arrival. Where specific physical or chemical tests are necessary, this engineer then consults the metallurgist. This permits quick rejection and replacement of materials not furnished in accordance with specifications, thereby saving much time and many delays in production.

All direct material that enters the products of the plant is recorded by purchase lot, and a record is kept of the serial numbers of the machines into which the material enters, so that the performance of the material in service can be traced. Moreover, if complaint is received from a customer of the failure of a part in service, the purchase history of the material of which the part is made can be traced by this method.

Drop forgings and steel castings are items that are purchased in irregular quantities. To simplify the purchasing of such items as drop forgings, rough forgings, bushings, name plates, and items of this character, a system has been devised whereby quotations are secured once yearly on these materials in varying quantities, usually in multiples of 25 and 50, from a minimum of 25 to a maximum of 500. This information is passed on to the production department where purchase requisitions originate. It can be seen that by having this information the engineer can specify materials required in economic quantities to take advantage of savings effected. This eliminates the necessity for securing quotations every time we wish to buy varying quantities of these articles. It also saves the sources of supply the work of figuring costs every time a small purchase is made.

The design originates in the engineering department, but is based on co-operation with the shop executives. A change in design may originate in the shop or in the field from the customer's experience. In such cases, it still goes through the engineering department, and if it is of any considerable importance, it is also known by and has the approval of the management. The use of new steels may be based on the recommendation of a steel mill, or upon knowledge gained by the staff in any other way. In some cases, the contractor supplying forgings may suggest changes in design of material that may improve the product or reduce the cost. This is especially true where the forging is of new design to replace a casting. When such suggestions are received, the purchasing agent consults with the production and engineering departments, usually through the standards department, and practical suggestions of this kind generally find favor.

Selection of Bearing Bronze

The choice of a bronze for a bearing is typical of the procedure for the choice of important materials that go into the product. Since high-speed production and heavy duty are considered as two important features of the machines built by the company, the right kind of bearing in the right place is taken as vital. When a new machine is in process of design, the chief engineer calls for a bearing bronze to meet certain conditions of load, speed, and lubrication. Usually, the purchasing department already has on file specifications from various makers of bearing bronzes, and has received personal calls from their traveling men. New bronzes advertised in the trade papers have also come to the attention of both the engineering and the purchasing staff. In consultation, therefore, it is decided to call on one or several of the makers for samples and quotations, with emphasis on the quality rather than on the price. This usually also results in a visit from a salesman, or from an engineer from the bronze maker, and several bronzes may be run under test before one is determined upon. The engineering department then watches the results of the bearing in service both at our plant and at the customer's plant, and gets reports from the customer and our service engineers. Naturally, the cumulative experience of the whole staff in trying out and installing bearings simplifies the choice in future cases, so that the work may not be duplicated in each case. However, no bearing bronze is ever accepted as "the last word," and makers are given the opportunity to demonstrate something new, but only when suitable preparation has been made by our standards engineer. Usually a number of the latest types of bearing metals are tested at a time.

In extraordinary cases, direct action may be obtained from the shop in an informal way before the matter of the new material is brought to the attention of the engineering staff. A case in point is that of a hacksaw salseman who came into the purchasing department with a saw that he stated would do six times the work of the saws that the shop was then using. Immediately, a purchasing agent sent him to one of the shop foremen for a demonstration. The salesman proved his point to the satisfaction of the foreman responsible for cutting up stock, and he was then turned over to the standards department for formal arrangement.

Commercial Standards Used

Commercial standards are used where possible in the factory product, as well as in the shop supply. The standards include those for bolts, nuts, washers, springs, bushings, ball and roller bearings, and oil and grease cups. However, in some cases, such as for bolts and nuts, it is possible to adhere to standard sizes, but not possible to accept the standard commercial article because of closer requirements of accuracy, finish, or heat-treatment that are necessary in a high-grade machine tool. When this condition is found, the parts are made in the shop or are bought on contract from specialists in the line. This phase of the problem is always before the engineering department in the design of new machines, and its staff is kept supplied with catalogs and trade literature by the purchasing department.

In considering the purchase price of direct materials, the ultimate cost for machines is a deciding factor. A 25-per-cent increase per pound in the bronze used in a bearing would ordinarily appear an important item when considered alone. Yet this increase might add only a few cents to the factory cost of a machine worth several thousand dollars, and by the use of the improved bearing, such improved service might be obtained as to result in increased sales and satisfaction of customers. If, in the case of finishes, the seller can prove that his paint will cover more surface with as good or a better coating, so that ultimate costs of production and maintenance are reduced, he can sell his higher priced product.

While direct materials are generally considered as of first importance, there is nevertheless no indirect material that is rated as too unimportant to receive its share of consideration. This reaches as far down as the soap used by the shop cleaners. It is the duty of the standards department to be alert for cost savings and improvements in the consumable shop supplies, such as tool steels, abrasives, and oils, as these items can add or decrease materially the cost of production of the machines. It is

recognized that the specification of such products as lubricating oil is now a specialized job. But by means of the laboratory analysis and service tests, the final choice between commercial grades and various brands is made. Every important raw material that enters the plant is submitted to a test to determine whether or not it is up to specifications, a sample being taken by the laboratory for the purpose from each lot. When the lot is then entered on the stock record, notations are made of the machine orders to which the material is applied. If a material used in the building of a machine should fail in service after it is in the hands of a customer, the record of the material can be traced back and the blame placed on the supplier or on the design, as the case may be.

As a final point, it is a definite policy that every salesman who calls at the plant is interviewed by someone higher in authority than a clerk. It is the belief that a company going to the expense of sending out a capable salesman has the right to expect this courtesy. It requires only a few minutes' time to interview these men, and we believe that it pays.

Selecting the Tolerances

By John F. Hardecker

COMING as they naturally do at the end of a drafting job, when the average observer is inclined to consider that the design is complete, it would be hard for a draftsman to convince an executive that the job should be held up an additional day or so for tolerances, when it would take in actual time to merely add these figures but a few minutes. Yet, the entire successful functioning of an elaborate mechanism may rest upon the successful choice of tolerances. As a consequence, the natural tendency of the draftsman is to prescribe rigid tolerances to make certain—with the consequent needless expenditure of money to maintain tolerances which are not strictly needed. If the other attitude is followed, namely, to deal lightly with the matter of tolerances, a whole run of parts may prove useless because ordinary manufacturing tolerances used when they are not specifically specified, will not give a satisfactory functioning part. A proper appreciation of tolerances, and an insistance upon this appreciation, is one of the major responsibilities of all those who aspire to executive direction of design work.

No greater instance of the necessity for a better appreciation of tolerances exists than in the transition of a development design into a production design. It is admitted that a great deal of time, money, and material must go into the development of a single experimental assembly of a new mechanism. Tests are made, designs modified, endurance runs made, and expert workmen employed in perfecting the first single unit to prove out the functioning of the design. Once successfully completed and accepted, the average executive believes it is a mere matter of making "record" drawings to put the part in production—something for an ordinary detail draftsman to do. Yet, right here, the best brains of the technical force should be called into play, in order to determine proper tolerances for these production drawings.

In fact, before launching into full-scale production, it may be a wise investment to manufacture and assemble a dozen mechanisms or so to prove out the tolerances decided upon, for there are many instances where actual experience alone will determine the best tolerances, namely, those which will give the greatest leeway to manufacturing in the shops, consistent with proper functioning and wear of parts in actual operation. To think that the existence of a functioning mechanism is the only requisite for putting it into production, is a gross error. In most instances, tolerances have to go through a period of development design similar to that which the idea itself had to go through before it became a proven idea.

Apprenticeship in Dull Times
Discussion

By C. J. Freund

ALTHOUGH he does not say so, the serious difficulties to which Mr. Forbes refers in his discussion on page 820, Vol. 68, of the *American Machinist*, are undoubtedly the ones which confront apprenticeship at all times, and not merely during times of depression. No attempt was made in the short article, nor in the one that followed to discuss apprenticeship problems other than those which are peculiar to dull times. An adequate discussion of all of the important problems of apprenticeship would require a long series of articles.

According to the second paragraph of the discussion, the article "mentions the need of the favor and confidence of the community, but does not say how to get it." Here again no attempt was made in the article to point out methods of gaining the favor of the community other than those which are particularly effective in times of depression. Experience has shown, as was pointed out in the article, that the employer who is willing to undertake apprenticeship at a period of depression needs to do little further to win the confidence of the public because the desire to train boys can be the only motive for his putting on apprentices at such a time.

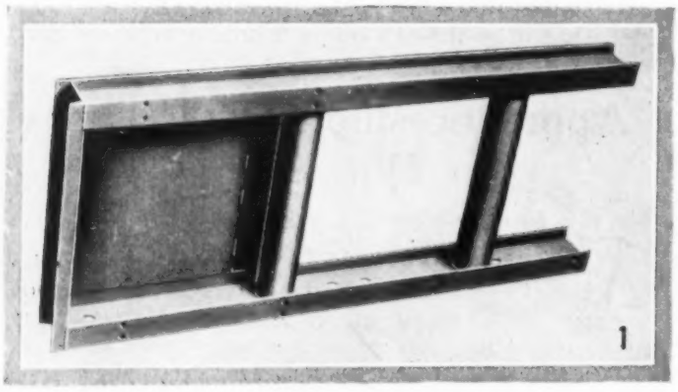
Mr. Forbes suggests that the lack of confidence on the part of the public is possibly due to the fact that so few apprentices make good. In the first place, if apprenticeship is properly administered, not few but many apprentices will succeed. It seems to be common experience in those shops where formal apprenticeship is carried on under the supervision of a separate department that about 50 per cent of the apprentices will be graduated.

In the second place, a low proportion of successful apprentices cannot be the primary cause of lack of confidence on the part of the public, because there is no lack of public confidence in the colleges and high schools of the country in spite of the fact that the proportion of college freshmen who finally obtain a degree is not anywhere near 50 per cent, and it is doubtful if the proportion of first year high school students who are graduated is as high as the proportion of apprentices who can be made to finish the courses under a careful administration.

I believe that Mr. Forbes himself brings out a more potent destroyer of confidence in apprenticeship when he states that "too often the general public only looks at the fact that apprentices are paid less than skilled workers, and it is thus considered an effort to reduce wages all along the line." The fear of the people that employers will not make apprenticeship primarily an educational undertaking is one of the important causes of lack of public confidence in apprenticeship.

Resisting Torsional Strains in Machinery Bases

Courtesy of the Lincoln Electric Company



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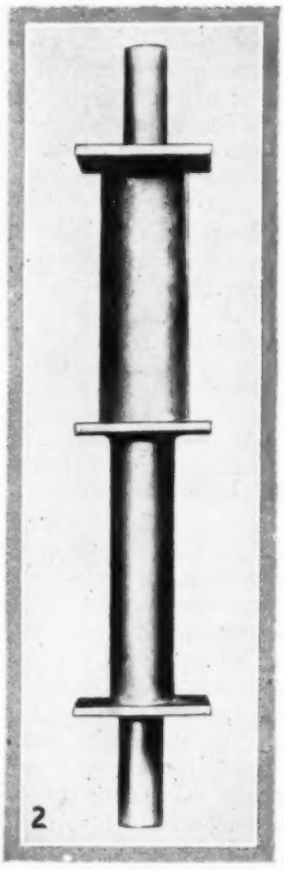
The advantage of tubular shapes for resisting the effects of torsion has been generally appreciated, but until the advent of welding it was necessary to thread flanges onto the tube and fasten these flanges to the other members by means of bolts. In Fig. 1 is shown a frame of a gasoline-driven hoist where resistance to torsion is important. Two tubular cross braces are used in the frame, and are butt-welded to the side members

Before this construction was adopted tests were made to determine the relative torsional strength of tubes butt welded in this manner. A test specimen was made up as in Fig. 2, and twisted in a standard torsion testing machine. The result is shown in Fig. 3. The amount of permanent twist can be judged by the position of the three plates on the test specimens. Another test is shown in Fig. 4. A channel and a tubular member of the same weight were welded to a common base. An upright was welded to the free end of each, so that the two uprights were parallel and perpendicular. The turnbuckle was then drawn up, and the twist occurred in the channel section



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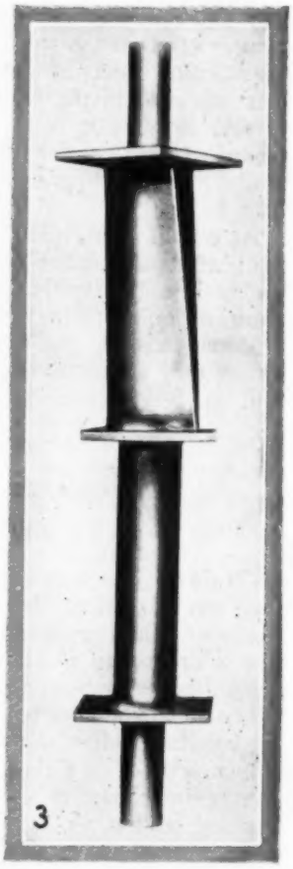

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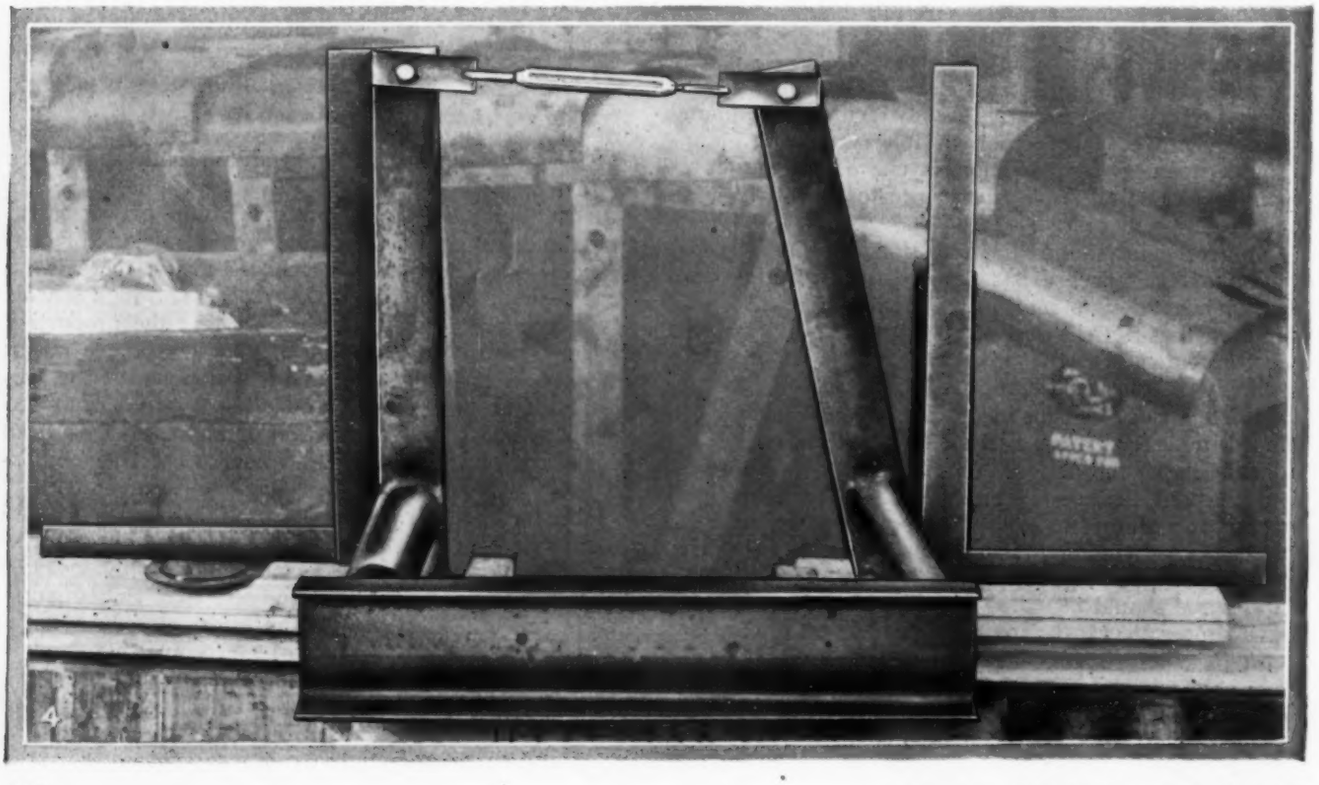

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Inspection Methods and Their Application

By Fred H. Colvin
Editor, American Machinist

Practices in various automobile shops showing how the final boring of connecting rods is done, and the methods of checking the parallelism of the holes

THE inspection of connecting rods may be said to consist primarily of having both holes of the proper diameter and in line with each other. This alignment refers to the holes being parallel in both planes; in other words, test bars in each hole should be parallel whether looked at from the side or from either end. Lack of parallelism when seen from the end, is usually referred to as "twist."

The methods of securing the desired results vary considerably in different plants and the machining and inspection are so closely connected that it is probably advisable to consider them at the same time. The exact center distance between the two holes is seldom tested except as it is done automatically by the boring or grinding fixtures. The maintaining of parallelism is dependent almost entirely on the accuracy of the fixtures and methods used in locating the rod for the various boring operations.

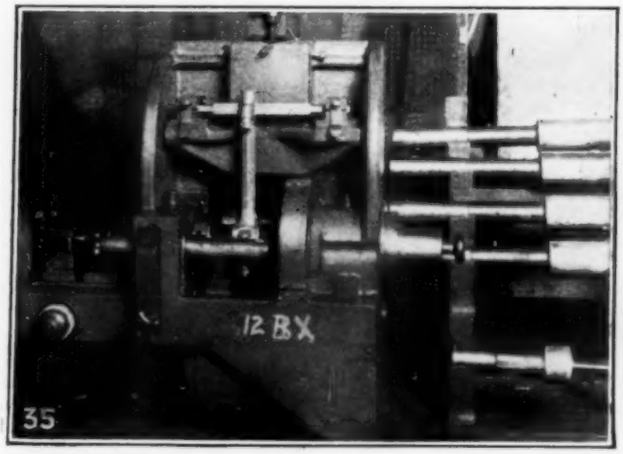
It is fairly common practice to endeavor to secure paralellism by locating the rods on close-fitting ground pins when finishing either end. The method of finishing the small end depends on whether the piston pin is clamped in the rod and bears in the piston, or whether it has a bearing in the connecting rod. In some cases it bears in both rod and piston, being what is known as the "floating" piston pin. When it bears in the rod, a bronze bushing is used and is frequently finished with a diamond or by grinding. In a few instances there is a final reaming or burnishing, although in most cases the surfaces left by the boring tool or grinding wheel seem to be preferred.

Practice also varies considerably regarding the final finishing of the large end or crankpin bearing. It is fairly common practice, even on low priced cars, to measure the various crankpins and to either select or machine the connecting rods to give the desired clearance for oil between the crankpins and the bearings. In most cases the large-end bearing is reamed while in some it is finished by broaching. In other cases it is finished with a single point tool, using either a steel or diamond cutting point.

There is considerable difference in practice as to securing the final alignment of the two holes in the connecting rod. The great majority of builders bore, grind or otherwise finish the two holes as nearly parallel as possible and if, upon inspection, the testing fixture indicates a deviation from parallelism, the rods are either bent or twisted until a satisfactory alignment is secured.

While this practice seems to be common, there are a few builders who feel that it is advisable to go to whatever trouble and expense may be necessary to avoid bending or twisting the rod in any way after it has been

The fourth article of a series. The fifth will appear in an early issue.



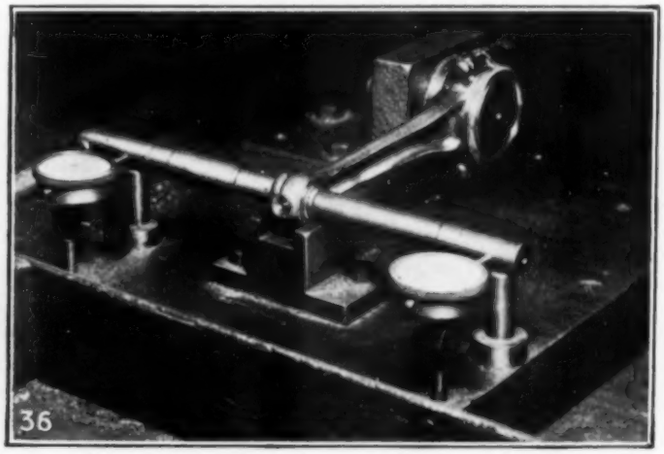


Fig. 35—The final boring of the large end of the Franklin connecting rod, which is virtually an inspection operation. The rod is so held that the final boring insures accurate alignment of the two holes. Five different boring bars are provided, so as to secure the exact diameter needed for any crankpin. Fig. 36—Checking parallelism of the Marmon connecting rod. With the rod firmly located by its large end and a long test bar, the two indicators show extremely small variation from exact parallelism. Any twist is indicated by the plugs on which the test bar rests

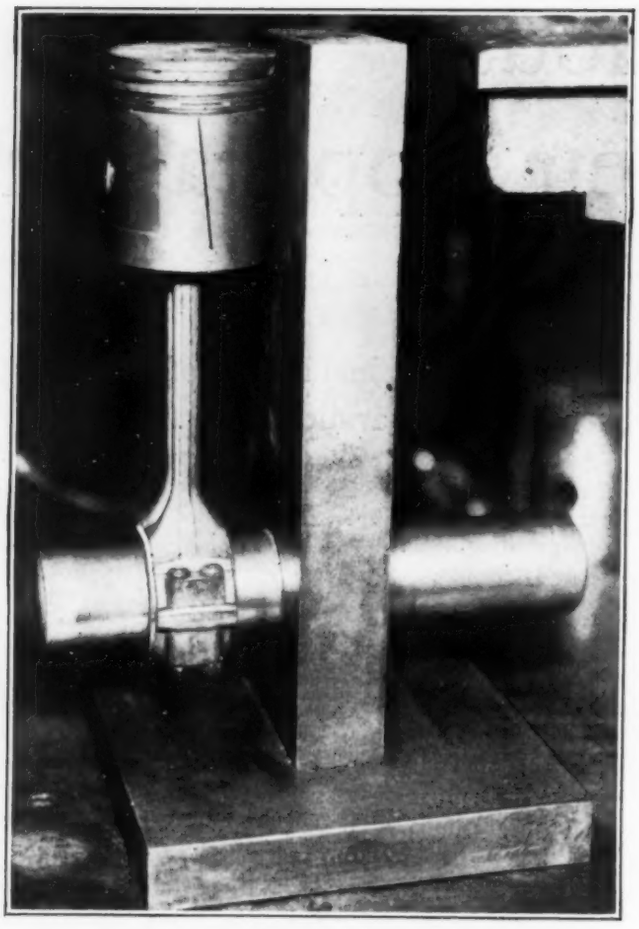


Fig. 37—A further test in the Marmon plant. This test is made after the piston and connecting rod are assembled, and checks the squareness of the side of the piston with the crankpin bearing in the connecting rod

machined. It is their feeling that, although the rod may be easily brought into alignment by this method, the stresses and temperature under which the rod operates are likely to more or less undo the work of straightening, and that the rod may go out of alignment after it has been in service for some time.

These builders do not permit the rods to be aligned in any way except by using special fixtures by which the rod is accurately held on one bearing while the other is being bored parallel to it. Such a device is shown in Fig. 35, from the Franklin plant. It is in reality the final inspection fixture that determines the parallelism of the two holes. With the rod supported by its small-end bore and the lower end held lightly and without strain, the large bearing is bored with a single point tool at a fine feed. Different boring bars are kept in readiness to give just the diameter needed.

The method used in the Marmon shop in checking the parallelism or squareness of the piston-pin and crankpin bearings in the connecting rod is shown in Fig. 36. Here the large end is placed over a stud that is a close, sliding fit for the crankpin bearing. A test bar that fits the piston-pin hole in a similar manner has been put in place and its ends are supported on the pins shown.

The opening in the central block checks the position of the small end of the rod with relation to the large end, while the dial gages check the parallelism of the holes at widely spaced points. The diameters of the ends of this test bar are carefully measured and the knurled por-

Fig. 38 — Testing Pierce-Arrow connecting rods for hardness on a Brinell machine. Each rod is inspected in this way before going to the machining department, so as to prevent unnecessary work if the forging is not of proper hardness. Fig. 39—Aligning Pierce-Arrow connecting rods before sending them to the assembly department. The checking and correcting fixture is held in a bench vise, so that bending or twisting can be done

Fig. 40—Checking and correcting connecting rods in the Nash plant. Special machines are provided for holding the rods, and also for checking the alignment both before and after making corrections.

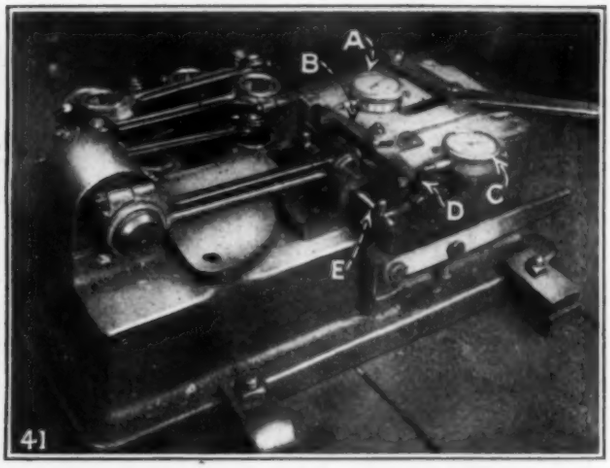


Fig. 41—Close view of a special testing device. The unusual feature is the way in which the combination of floating levers checks the alignment in both directions with only two gages. It is unnecessary to swing the rod up to another gage

tion makes it easy to wring the bar in and out of the small-end bearing.

The fixture shown in Fig. 37 is for testing the squareness of the assembled piston with the crankpin bearing of the connecting rod. The large end of the rod is a snug fit over the bar in the upright and is at a right angle to it. By sighting between the piston and the vertical surface of the upright it is easily possible to detect any variation from squareness between the sides of the piston and the crankpin bearing.

The connecting-rod forgings used in the Pierce-Arrow are tested for hardness in a Brinell machine as shown in Fig. 38. This machine is hydraulically operated and has a large gap to accommodate pieces of considerable size. The fixture on which the connecting rods are inspected and straightened, where necessary, is shown in Fig. 39. A test bar through the piston-pin hole enables the squareness of the holes to be checked in two directions.

Connecting rods are checked and adjusted at the Kenosha plant of the Nash Motor Company in the fixtures shown in Fig. 40, which shows the rod being corrected at the left and tested at the right. The fixtures have substantial bases so as to withstand the stresses imposed. The large end of the rod fits on a substantial stud, and a long test bar is put through the piston-pin hole. If it is found that the rod is not square in both directions, it is bent or twisted, as may be necessary to secure the desired alignment. The alignment is being checked by the operator at the right.

A close view of the testing fixture is shown in Fig. 41, with a connecting rod in place, but with the long test bar through the piston-pin hole omitted in order to show the gaging mechanism more clearly. It will be noted that the plunger of the gage *A* bears against one end of equalizing bar *B*, while that of gage *C* contacts with the bell-crank *D*, which in turn bears against the near end of equalizing bar *E*. This combination avoids the necessity of swinging the connecting rod up to another gage at right angles to the first, as has been common practice in many inspection departments.

The device checks squareness in both directions at the same time, and enables the inspector to make the necessary corrections in a minimum of time. The two levers enable the plungers of both gages to be brought against

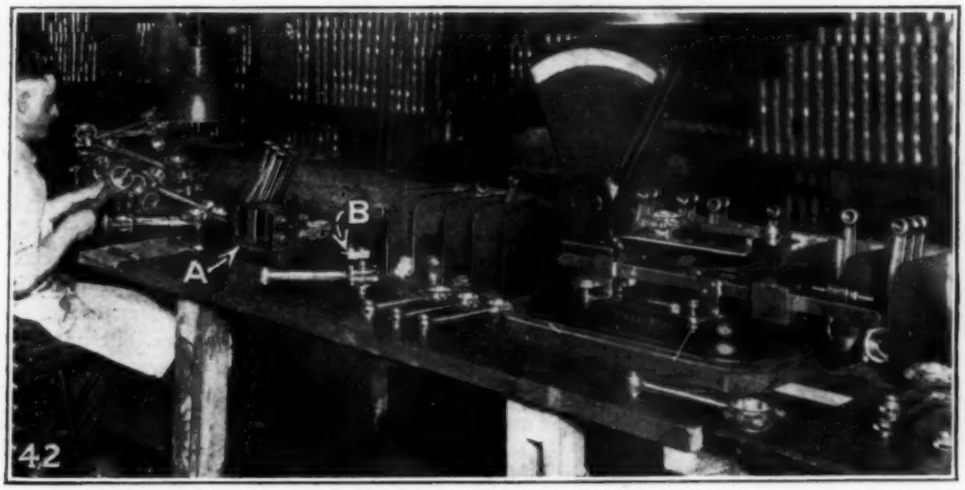


Fig. 42—Final inspection bench in the Nash plant. Here the rods are inspected as to various dimensions, and are also carefully weighed and assorted into different groups, so that each engine will have rods of uniform weight.

Fig. 43—Connecting rod inspection at the Stutz plant. The rod is mounted on a special mandrel that rests in V-blocks, and the alignment of the holes is checked as to parallelism or twist

Fig. 44 — Weighing connecting rods and pistons in the Stutz plant. The rods and pistons are weighed together and paired off so as to secure a uniform selection of rotating and reciprocating parts. Fig. 45—Inspecting the small bore of Oakland connecting rods as they come from the final boring machine. The testing plug-gage has several different diameters which permit the holes to be accurately gaged and sorted for different pins

the test bar with very little effort on the part of the inspector. After being inspected and corrected for straightness, the connecting rods go to the bench shown in Fig. 42 for final inspection. Here they are checked for diameters of both bores, for thickness of the sides in the go and no-go gage at *A*, and for parallelism of the sides with the bore by means of the revolving dial gage *B*. The weight of the rods is very carefully checked and they are sorted into the various compartments on the bench. Each of these compartments holds six rods, so as to insure rods of the same weight being selected for any given engine. The rods are taken in lots of six, direct to the engine assembly.

A good example of the standard method of testing connecting rods for both parallelism and twist is shown in Fig. 43, in the Stutz shop. Here the rod is mounted on a standard mandrel having a collar to locate its position. Placing this mandrel in the V-blocks, and placing a test bar through the piston-pin hole, it is easy to detect either a lack of parallelism with the rod in the position shown, or a twist in the rod when it is swung into a vertical position.

Fig. 46—Checking the weight of connecting rods and piston pins in the Oakland plant. The scales are specially arranged for this work, so as to show not only the total weight of the rod but also its distribution between the two ends

Weighing both pistons and rods has become common practice in the endeavor to secure uniform reciprocating weight. It is not quite as usual to combine the weighing of both the piston and the rod as shown in Fig. 44. This is accomplished by having two scales close together on the bench, so that as a rule, the same inspector can handle pistons as well as connecting rods. The scale at the right is equipped to weigh the rods with reference to the center of their mass rather than their total weight. Late experience has shown that this method secures a better balance and a smoother running engine.

Inspection of the small ends of the rod immediately after boring is shown in Fig. 45. The special boring machine is in the Oakland plant and employs a single-point tool. The test gage checks the size of the holes as the rods come from the boring machine.

Quiet running engines require carefully balanced moving parts, whether they be revolving or reciprocating. The connecting rods come under both heads, but instead of being given a running balance they are weighed to get both the center of gravity and the mass.

The method is shown in Fig. 46, where one operator performs both operations, almost simultaneously. The scale at the left is fitted with a bar having a projection at the center for holding the small end of the rod and one at the right which supports the large, or crankpin end. The scale dials are not marked in pounds but have plus and minus marks that determine the permissible variation in the center of gravity.

The complete rod, including cap, bolts and piston pin, is weighed as a unit, and the center of gravity must be kept within the prescribed limits. The rods are kept within very close limits in both tests and by sorting into sets there can be little vibration caused from irregularities in rod weight or its distribution. These scales are in the Oakland plant.

Foreign Trade Statistics Require Revision

CUSTOMS classifications in the United States consist of 705 items, as compared with several thousand in some foreign countries. Dr. Julius Klein, Director of the U. S. Bureau of Foreign and Domestic Commerce, concludes that this situation is enough to drive any would-be exporter to despair in his endeavor to fit his commodity into the proper classification, especially when he is often confronted with the probability of a heavy fine if his decision should not be the correct one. An assemblage of economic experts of the League of Nations is now directing attention to the correction of situations of this kind.

Our classifications of official foreign trade statistics are recognized to be of more immediate practical value than those of most other countries, particularly because no elaborate procedure or formal congressional action is required to alter the statistical grouping if trade needs so require. In the majority of other major commercial countries, such changes can only be accomplished with lengthy and elaborate parliamentary procedure.

The lack of comparability of trade figures is also obstructive to the smooth course of international trade. In the face of tightening competition, some uniform bases of measurement of trade flow are indispensable; at least approximate parity of grades, nomenclature, and classification.

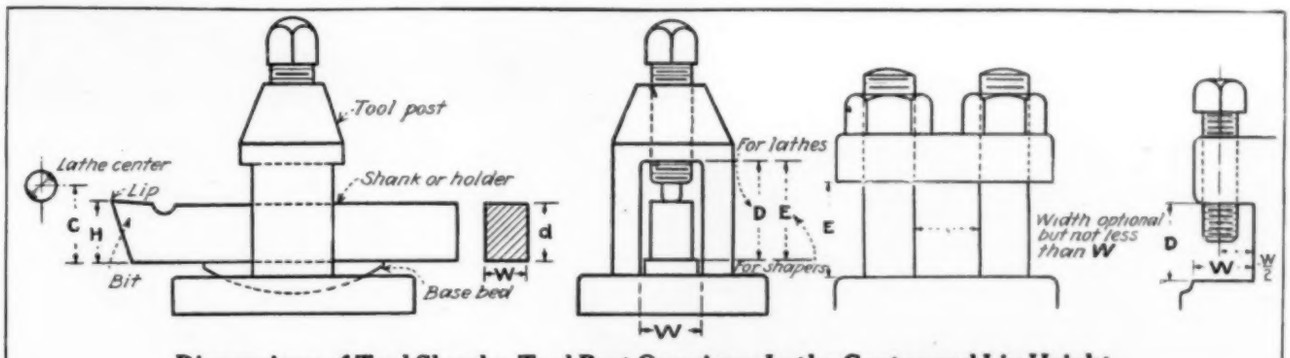
Take automobiles, for example. There are sixteen different types of classification in as many different countries in Europe for this commodity whose exports from the United States totaled $112,000,000 last year. As the American manufacturer makes his plans to enter each market successively, he is confronted with the necessity of varying the type, or weight, or horsepower, or other detail of his product in order to meet these requirements. In selling less expensive units, such as small electric motors, it is even more complicated, and involves a highly technical and careful appraisal of each situation. Frequent changes add to the complexity.

In these days of waste elimination and standardized output, such a network of cutting up and specializing what would otherwise be a unified market area means greater production specialization, and consequently higher costs and slimmer sales.

Proposed Standards for Tool Posts and Tool Shanks

IN LINE with the intention of the American Engineering Standards Committee to proceed with the standardization of machine tool elements, the sub-committee on tool holder shanks and tool post openings has forwarded to the committee for approval the standards shown in the accompanying illustration. Thirteen sizes are shown, each size to be known by its "tool number."

The standards have been adopted in this form by the Society of Automotive Engineers, but it remains for the other societies which are members of the committee to give their approval. The subject is still open to discussion, and comments on the proposed standard as shown here will be forwarded by the *American Machinist* to the chairman of the committee.



Dimensions of Tool Shanks, Tool Post Openings, Lathe Center and Lip Height

Tool Number	Shank Section			Lathe Opening			Planer and Shaper Opening			Lathe Center Height			Lip Height	
	Max. d	Nominal dxw	Max. w	Min. D	Nominal DxW	Min. W	Min. E	Nominal ExW	Min. W	Max. C	Nom. C	Min. C	Max. H	Min. H
00	0 85	¾ x ⅜	0 40	1 27	1 ⅜ x ½	0 49	1.04	1 1/16 x ½	0 49	0.93	⅞	0 85	0.85	0 75
0	0 99	⅞ x 7/16	0 48	1 48	1 ½ x 9/16	0.57	1.19	1 ¼ x 9/16	0.57	1.09	1	0 99	0 99	0 87
1	1 15	1 x ½	0 56	1 72	1 ¾ x 13/16	0.68	1 38	1 7/16 x 13/16	0.68	1 26	1 3/16	1 15	1 15	1 00
2	1 34	1 ¼ x ⅝	0 67	2 00	2 x 13/16	0 81	1.61	1 ⅝ x 13/16	0 81	1 47	1 3/8	1 34	1 34	1 25
3	1 56	1 ½ x ¾	0 80	2 34	2 ⅜ x 1	0.96	1 87	1 ⅞ x 1	0 96	1.72	1 9/16	1 56	1 56	1 50
4	1 81	1 ¾ x ⅞	0 95	2 71	2 ¾ x 1 3/16	1 14	2.17	2 3/16 x 1 3/16	1 14	1 99	1 13/16	1.81	1 81	1.75
5	2 11	2 x 1	1 13	3 16	3 ⅛ x 1 ⅜	1 35	2.53	2 9/16 x 1 ⅜	1 35	2 32	2 1/16	2.11	2 11	2.00
6	2 43	2 ⅛ x 1 ¼	1 34	3 65	3 11/16 x 1 ⅝	1 61	2.92	3 x 1 ⅝	1 61	2.67	2 7/16	2 43	2.43	2 25
7	2 86	2 ¾ x 1 ½	1 60	4 29	4 ¼ x 1 ⅞	1 91	3.43	3 7/16 x 1 ⅞	1.91	3 15	2 ⅞	2 86	2 86	2.75
8	3 34	3 x 1 ¾	1 90	5 00	5 x 2 ¼	2 27	4 00	4 x 2 ¼	2 27	3.67	3 ⅜	3 34	3 34	3 00
9	3 87	3 ½ x 2	2 26	5 80	5 ¾ x 2 ¾	2 70	4 64	4 ¾ x 2 ¾	2 70	4 25	3 ⅞	3 87	3 87	3 50
10	4 50	4 ¼ x 2 ½	2 69	6 75	6 ¾ x 3 ¼	3 21	5 40	5 ½ x 3 ¼	3 21	4 96	4 ½	4 50	4 50	4 25
11	5 25	5 x 3	3 20	7 87	7 ⅞ x 3 ⅜	3 84	6 30	6 ⅜ x 3 ⅜	3.84	5 77	5 ¼	5 25	5 25	5.00

How Citroen Makes Connecting Rods

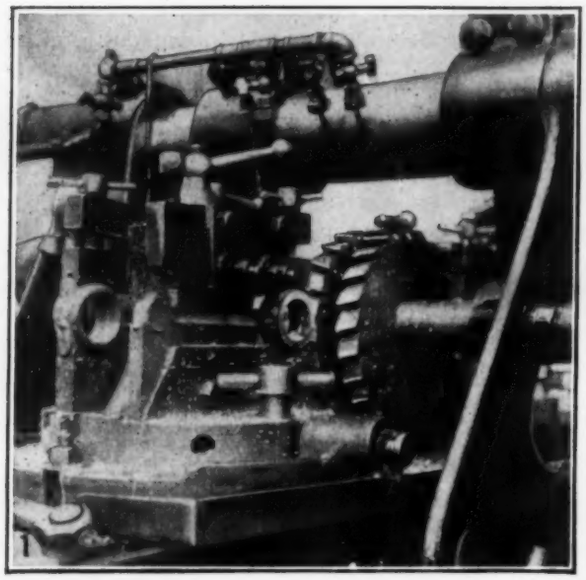


Fig. 1—Indexing fixture for milling connecting rods. The large end of one rod and the small end of another are straddle milled at the same time. Then the fixture is indexed, bringing the opposite ends of the rods into position for milling. The rods are held by equalizing clamps. While two pairs of straddle mills are used, but one pair can be seen

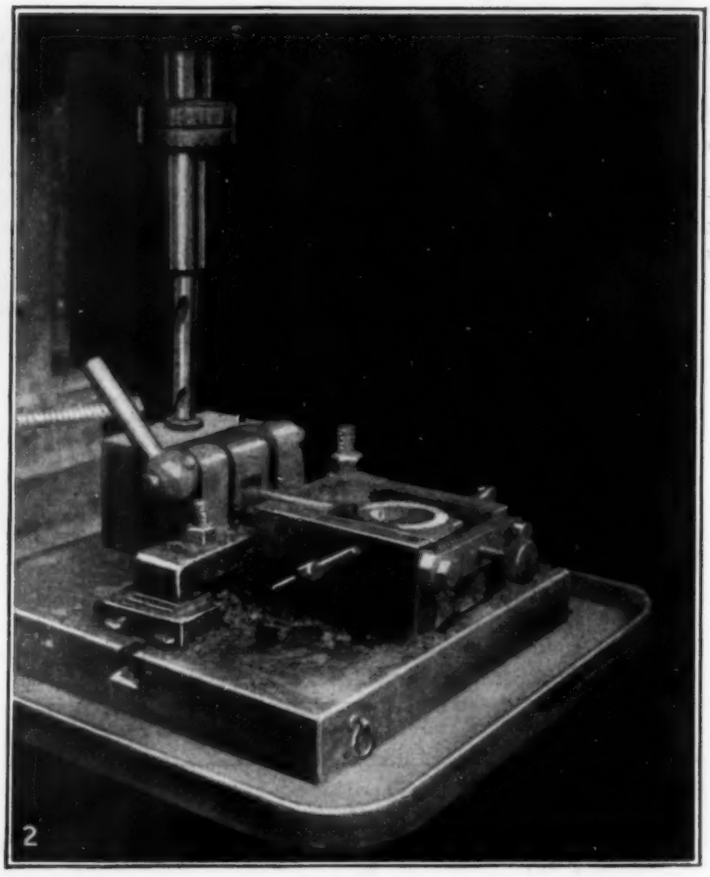


Fig. 2—Fixture for drilling the hole for the piston pin. The small end of the rod is centered and clamped by the fork shown, while the large end is located and held by two side screws and the end screw in the swinging latch. Time, 85 seconds

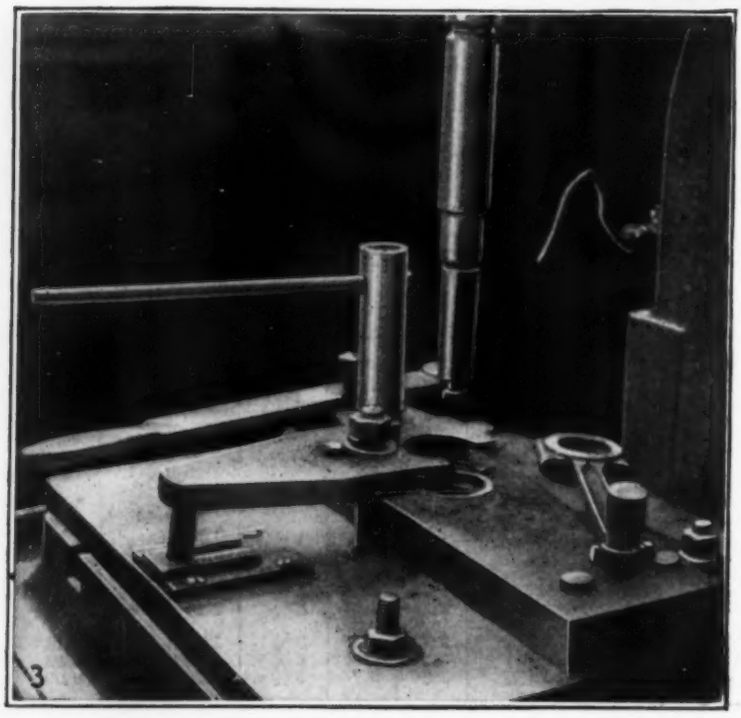
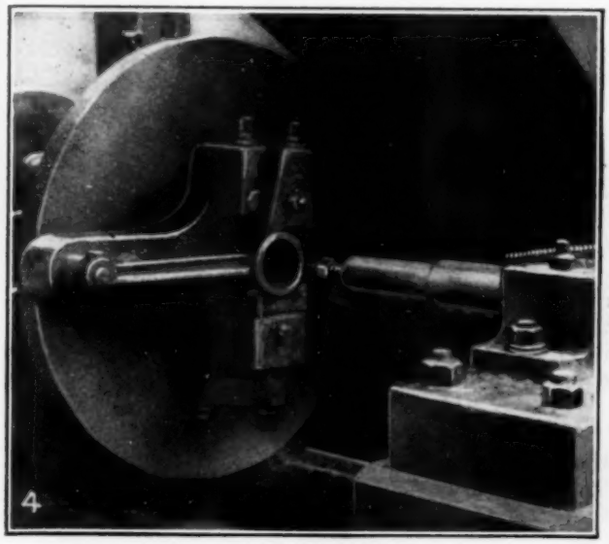


Fig. 3—Rough boring the large end. The rod is located by a plug through the small end. It was swung out from under the clamp to show the construction of the fixture and also the guide bushing for the lower end of the boring bar. Time, 95 seconds



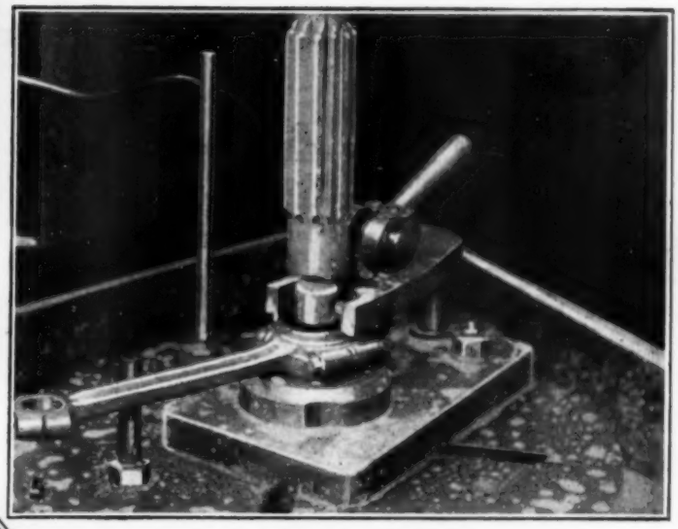


Fig. 4—A finishing cut is taken with a single point tool to insure a true seat for the bushing. The rod is located in the faceplate fixture by a plug in the small end. The faceplate is counterbalanced, and the bar is piloted in a bushing in the spindle

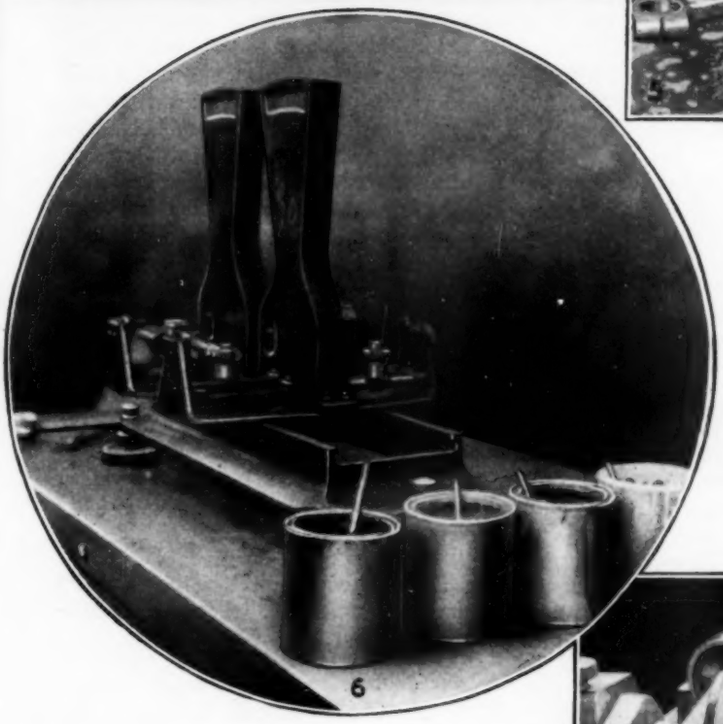


Fig. 5 — Reaming the large end of the rod after the cap has been assembled and the bronze bushing clamped in place. An expansion reamer is used and the fixture has a quick clamping device, operated by a cam

Fig. 6—Weighing the rods for mass and for the balance, that is, for the weight of the large end as well as the total weight. Rods are carefully selected in sets of four and are marked with five colors of paint, each color indicating rods of the same weight and balance

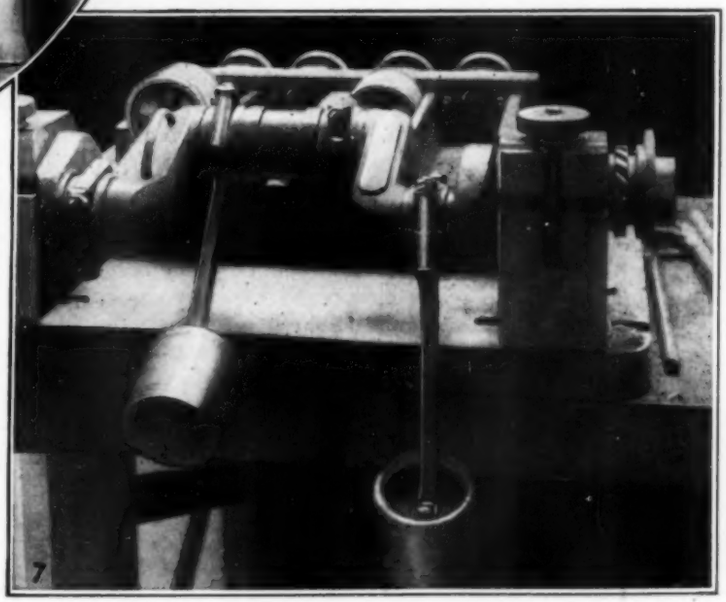


Fig. 7—Testing alignment of rods and pistons. A line parallel with the pin hole is scribed across the top of the piston. The rods are rotated, bringing each piston into a recess where its contact with the walls check the alignment. A plunger at the rear, carrying two prick punches, is struck by the hand. Both prick marks should be on the scribed line. If not, the rod must be twisted

Asking Quicker Deliveries Than Are Needed

"MR. HOLLAND, I am plain sore. Our salesman finds out that, after all our overtime and worry to meet the Darrow company's delivery date, the machines lay in their shop over a month before the foundations were ready for them."

Mr. Austin, general manager of the Consolidated Machine Company, had called Mr. Holland on the phone about fifteen minutes before and asked if he might drop in immediately. "Not that the question is urgent, but that I am all excited over it," explained Mr. Austin over the phone. Mr. Holland had replied that he was always delighted to sit in with executives who were in such a state of mind.

"Unfortunately we run into such customers occasionally," replied Mr. Holland. "Suppose you tell me about the conditions under which the order was placed."

"Well," went on Mr. Austin, "I want to start back farther than that. Darrow's have been talking about this extension of their plant for about three years. We played along with them and spent a lot of money in arriving at the best tooling layout for their job. Our competitors were not in on the job at all. Last December, the appropriation was approved and orders given to have the shop ready for operation in ten weeks. Of course, the president of Darrow's knew such a program was impossible, but he decided to make his suppliers the goat in the eyes of the board rather than oppose their plan himself. So he gets us, and others, to accept orders to meet his program. We protested, but finally had to accept his delivery date at regular prices or lose the order. In other words, our competitors were in on the job after we had paid for the development work, and the competitors were willing to promise anything to get the order. We strained every nerve, and, by some really clever and expensive work, made our date. None of the other suppliers did, although they had made the same promises as ourselves."

"Of course, such special rush jobs never net the manufacturer much profit. After deducting for expensive development work and expensive overtime, to say nothing of the wear and tear on the executives to make the thing go, there isn't much question whether you got a square deal," agreed Holland.

"My first thought was to send them a bill for the extra costs of the rush work. Of course, we wouldn't get our money, and we would stir up hard feelings. What gets me is that I can't find any way to pass on to such people the costs they ought to stand," went on Austin.

"Another plan would be to tack the extra cost on future orders from Darrow. That would mean they would turn to your competitors," mused Mr. Holland. "I wonder if you shouldn't forget trying to make them pay for this and start an educational campaign to prevent their doing it again. Drop in to see their president some day. You might tell him that in the future you will have two kinds of quotations, one for orders that fit into your regular production schedule, and another, for rush jobs, to cover overtime and similar extra expenses. It might be well to point out, also, that the extra expenses of this last order will be distributed, and the innocent will suffer with the guilty. Of course he would not want to help pay for somebody else's rush jobs, and yet he is making others pay for his."

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

Discussion

How Much to Invest for Fixtures?

Just one year ago we were confronted with the same situation as was Mark Matthews. We were asked to figure on a line of machines. Nothing of the same nature had ever been marketed, so naturally there was some doubt about the demand for such a machine, and also about the design. It was a problem of jig and fixture work, and necessitated the expenditure of some $2,000 for permanent equipment.

After much debate we finally decided to

make the first hundred machines with temporary fixtures, and lucky for use that we did. While the general design of the machine has remained the same, it has been changed so much in its details that a permanent set of fixtures at that time would now be obsolete. Many of them would find no use whatever even in a revised condition, due to the fact that we have substituted die castings for machined cast-iron parts in a number of instances.

Our temporary fixtures cost somewhere in the neighborhood of $600, and after revisions had been made in the machine, we found we could tool up completely for $1,500, making our total cost for tooling $2,100. Had we tooled permanently in the first place we would have been just $2,000 out, quite a lot of money in view of the amount involved in the original contract.

The amount is small compared with that mentioned in the Mark Matthews case, but the circumstances seem to be identical, and as our case is one of actual experience I am inclined to think that Mr. Holland and the banker were on the right side of the fence. On top of this I happen to know that a would-be competitor of ours nearly went broke and lost all chance of receiving an order simply because he insisted on tooling up completely first, thereby delaying delivery beyond all reasonable time limits. —HENRY T. YOUNG.

Too Much Inspection

The cost of 100 per cent inspection is certainly high, but the cost of allowing an imperfect product to reach the customer is also high. The proper use of spot checks after operations is all that is necessary in a majority of cases.

One way to increase inspection cost is to add extra inspection operations to cover complaints from the field. Many of these complaints are only minor in nature, and happen once in a blue moon. Still extra inspections are instituted, and allowed to run forever.

The writer knows of a firm which pays a bonus to inspectors who find imperfect work. The rejected product is then reinspected, and the second inspector is paid a bonus on all good parts found among the rejects, the original inspector losing a proportionate part of his bonus for all good parts discovered. —E. F. WEIMAR.

A very satisfactory method of inspection in a shop employing from forty to sixty men, and engaged very largely in contract work on a great variety of general machine shop work, is as follows:

Before starting any operation the inspector and operator go over the work together, to make sure that the operator understands at the beginning the accuracy and finish required, and especially to make sure that the operator has such information as he cannot glean from the average drawing furnished by the firm having the work done. The first piece is inspected as soon as the first operation is finished, unless it is a very special job, and each subsequent operation is treated in the same way. In case there appears to be a likelihood of something going wrong, an occasional piece is inspected, as it seems necessary, until everything is going right. A general inspection is made when the parts are finished, except when the assembly operation will be sufficient check.

—JOHN MARK MAY.

Inspection calls for the use of much common sense. For instance, one manufacturer may find it best to have his product inspected at only two or three stages of its manufacture, but that every piece must be checked at these points. On the other hand, another manufacturer will have a much larger number of inspection points and his inspectors will check approximately ten per cent of the parts, or only enough to make sure that nothing has gone wrong.

Automobile manufacturers have many different inspection problems; some parts have to be inspected individually, others require practically no inspection so long as the tools are checked periodically. At the other extreme are certain textile and agricultural machines that are inspected only after completion, and, generally, only for results. In general, the danger lies in too little inspection rather than too much.—J. J. PROVOST.

Too much inspection is to be feared chiefly because of the deadening influence on production of the attempt to get too large a percentage of the work up to standard. It is impractical to conduct manufacturing operations in such a way as to produce only work that is in accordance with specified standards. Inevitably, there will be some bad work. It is a matter of economy to do a certain amount of unsatisfactory work, paradoxical as this may seem on first thought.

After the various component parts have passed inspection in the respective parts making shops, and have been placed in the finished parts stores, it may be assumed with reasonable assurance that they can be assembled satisfactorily. There is, however, an ever-present tendency for work to slip away from the desired standards of quality, and to do so by such small daily increments that the changes are difficult to detect. Measuring devices and cutting tools are subject to wear. The fact that wear does not take place rapidly or evenly makes the process all the more subtle. Then there is always the danger of a gage being accidentally injured and work incorrectly machined in consequence. In close work these troubles are accentuated by personal errors and by a multitude of other influences.

The net effect is that, in spite of every

reasonable precaution, quality will slip and the errors may not be detected until the parts are issued for assembling. If the errors are due to gradual wear, or similar cause, the condition will be manifested first by a slowly increasing difficulty in assembling. With a highly organized inspection service in the shops and extending into the sub-assembly and final assembly room, a means is provided for avoiding such difficulties. The assembling rooms are a particularly fertile field for revealing errors. Proper inspection is able to catch these errors promptly, and pass word back to the factory for the help and guidance of all.

—HARRY KAUFMAN.

Differences of opinion as to what constitutes adequate inspection vary from the unreasonable views of the user to the extreme laxness of some manufacturers. The purchaser makes specifications which are very hard to meet. This is done for his own protection with little consideration for the manufacturing standpoint. On the other hand, many manufacturers do not consider the purchaser's standpoint.

In order to balance requirements with profits, a careful analysis must be made of both. In this analysis the manufacturer must forget immediate profits, and consider ultimate profits resulting from the reputation for producing a strictly high class article. There is an acid test for quality inspection which the manufacturer can apply to his own product, and it is this: "Does my inspection furnish reliable knowledge of the quality of the product at all stages of manufacture?"

One of the factors that must be considered is the value of the product. If the product is expensive or if a number of expensive operations are performed upon it, then the necessity of saving each piece, or of preventing expensive machining operations is of paramount importance. In this case the process inspection should be made as soon as practical after each operation. If the product is small and inexpensive, such as automatic machine screws, then very little time or energy can be expended on the inspection.

Another factor is the distance from the intermediate operations to the final operation. If the part is shipped many miles away before it is assembled, then the inspection must be very close. Experience, and knowledge of the troubles developed in the product at various operations, together with a thorough analysis of the causes of such troubles is the only basis for determining the frequency of inspection and the strategic points where inspection should be made.

The effectiveness of process inspection is gaged by the amount of defective products that reaches the final operation before being detected. If it is found that extra work is required to make supposedly interchangeable parts fit properly, then you can safely say that your process inspection is not what it should be.

The benefits derived from proper process inspection are not confined entirely to preventing defects, but include increased production because the workmen produce more and better goods when they know that the quality is being controlled. Adequate inspection allows the executive to cease worrying about losses in defective goods.

—A. DAVIDSON.

A Question of Family Income

"Firms are not institutions for maintaining family incomes," so states Mr. F. P. Terry. It seems to me that one of the most important aims of any concern should be to pay as large an income as possible, to as many families as possible, so that these families may buy manufactured products. When Ed Smiley's income was cut in two, his purchasing power was also cut in two, and eventually George Carey's firm will suffer. It is, of course, necessary at times to lay off men, but every effort should be made to avoid it. When purchasers of manufactured goods suffer, manufacturers in general suffer; and when manufacturers in general suffer, George Carey's firm suffers also.

—F. M. SHORES.

Training Men for Different Jobs

The worker with a knowledge of more than one job will have no fear of being laid off in time of slackness in his own department, and the company will have a valuable and trained man on hand for any emergency work on another job. Moreover, it supplies the man with a means for self-expression, and with an opportunity for developing his latest qualities.

A lot of the industrial work of today is monotonous and the man who is engaged in that work loses his interest in his job, together with his incentive to do better and more rapid work. The monotony of the work will sometimes affect a worker's interest to such an extent that he will be bored and finally irritated. Much of this work has just enough requirement of skill and judgment to demand some concentration, but not sufficient to occupy the mind. This kind of work is more monotonous than the job which requires practically no thought at all, because in the latter case the mind can busy itself with other things.

The change of work obtained by training for different jobs will exercise different muscles and require a little different attitude of the mind towards the work. The worker will be supplied more of an incentive, he will be more interested in the value of each piece of work he does and the necessity for its accuracy, and he will be led to check his own operations.

—A. GORDON.

Locomotive Repairs at Little Rock

An outdoor pit for stripping engines—Advantages of sandblasting the frame and other units—A portable cylinder boring rig—Assembling valve bushings

STRIPPING locomotives, at the Little Rock, Ark., shops of the Missouri Pacific Railroad Company, is carried on in an open pit that lies parallel to the erecting shop pits, and adjacent to the transfer table. The purpose of doing the work out-of-doors is to eliminate the handling of a rather dirty task within the shop. Climatic conditions are favorable for outdoor work during the greater part of the year, so that little difficulty is encountered in this respect. A view of the pit showing the engine in place being stripped, is illustrated in Fig. 1. The transfer table lies at the front of the locomotive shown. A 10-ton traveling crane serves the pit and aids in dismantling some of the heavier units. The crane travels on two tracks, supported by framework that straddles the pit, allowing sufficient working clearance on each side of the engine.

Parts such as fountains, injectors, boiler checks, and blow-off cocks are sandblasted at one side of the pit, as they are dismantled, as shown in Fig. 2, then they are delivered to the shop for repairs. Other parts, such as rods, motion parts and guides, are transferred to an outdoor lye vat located at the rear of the stripping pit, where they are cleaned before being sent to the shop for repairs.

After locomotives have been unwheeled and placed on dollies, they are returned to the stripping pit for the sandblasting of the frames, the smokeboxes and all outside surfaces such as cylinders. The frames are whitewashed, while other surfaces are coated with "No-oxide," then the locomotive is returned to the shop for repairs. Sandblasting in connection with the coating applied thereafter has a tendency to show up defects that ordinarily would be overlooked.

Cylinders are bored by a motor-driven rig, mounted on the cylinder casting at the front and rear ends by adjustable clamping plates. The boring bar carries a cutter head in which there are three cutting tools. In taking a finishing cut, however, only one tool is used. The driving motor is housed in the truck, shown in Fig. 3 at the right. After the motor and driving belt have been aligned properly, a wedge is placed under one of the rear wheels of the truck to keep it from shifting while the work is in process. A near view of the boring device is illustrated in Fig. 4. When not in use, the rig is placed in a compartment provided for it in the truck, thus making it possible to keep the entire outfit together and to simplify transportation.

A device for forcing valve-chamber bushings into place is shown in Fig. 5. After the bushings have been started at both ends of the valve chamber a screw and two draw plates are assembled through them as shown. The nut at the left is drawn up until the plates are tight against the bushings, then the air-driven unit shown at the right is connected to the opposite end of the screw. The driving unit, operated by an air motor, houses a drive gear, an intermediate gear, and a driven gear, the last mentioned having a hexagon hole corresponding to the shank of the screw. With the motor in operation the bushings are drawn together. A block is used to support the outer end of the driving unit, to which the motor is attached, preventing it from turning when in operation.

The first part of the article. The conclusion will appear in an early issue.

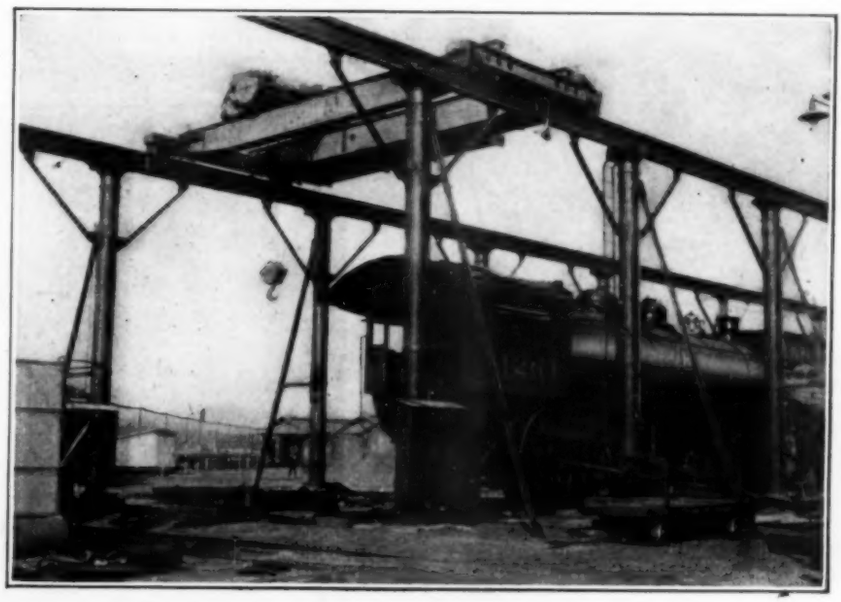


Fig. 1—An outdoor pit is used in connection with the stripping of locomotives, thus eliminating the handling of a somewhat dirty operation within the shop

The pit is served by a traveling crane to assist in dismantling heavy parts. The pit lies parallel to the erecting shop, and adjacent to the transfer table

Fig. 2—Boiler checks, blow-off cocks, and similar parts are sand-blasted before being sent to the shop for repairs, whereas parts such as connecting rods and motion parts are cleaned in a lye vat located at the rear of the stripping pit. Frames and all outside surfaces of locomotives are also sand-blasted and then coated with white-wash or an oxide paint. Cracks and other defects are easily detected after the coating has dried

Fig. 3—Boring a cylinder with a portable, motor-driven rig. The truck shown at the right is aligned properly, then it is prevented from shifting out of place by a wedge placed under one of the wheels. The truck has a compartment to house the boring device, so that the complete unit can be kept together

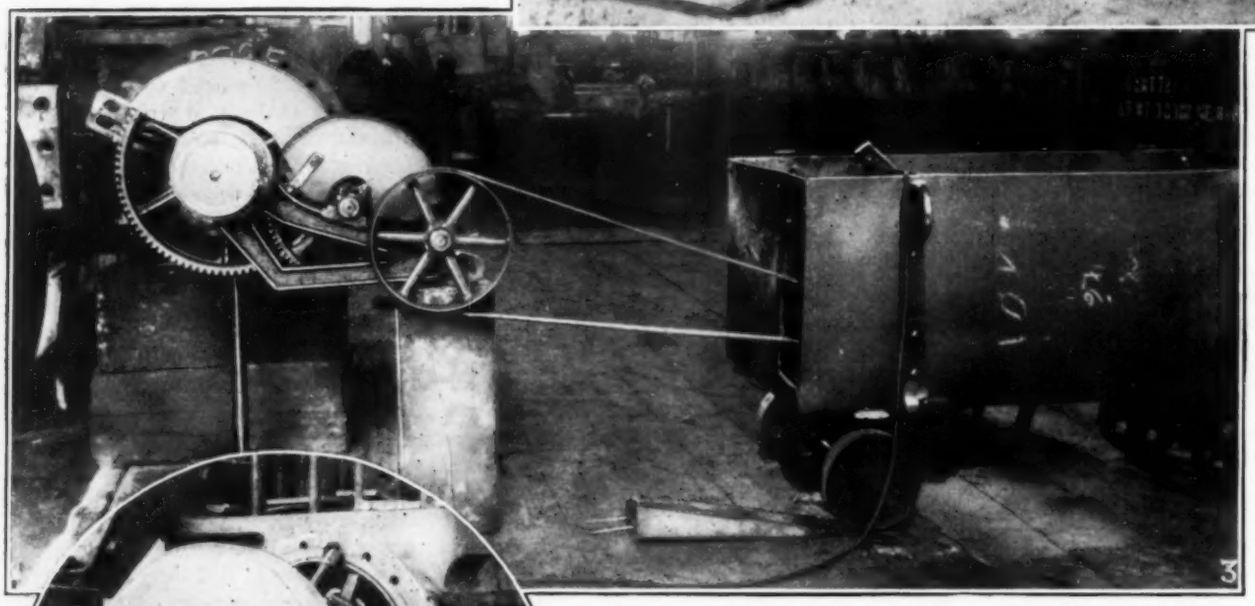
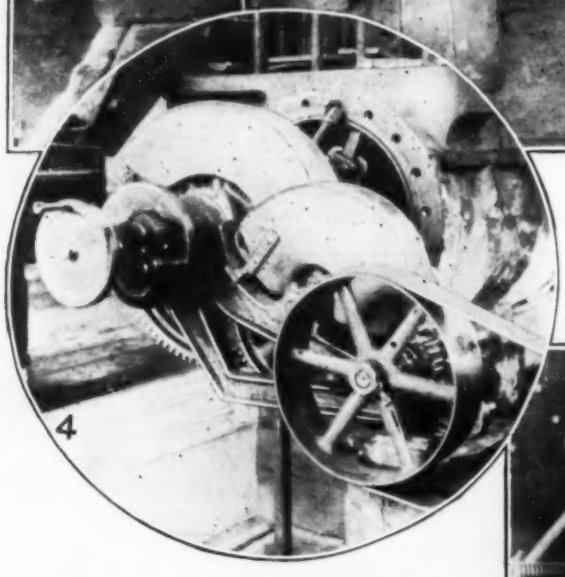


Fig. 4—A close-up view of the boring attachment in place on a cylinder. Three cutting tools are used in taking the roughing cut, while but one is used for the finishing operation. At the right may be seen the pulley that is belted to the portable motor



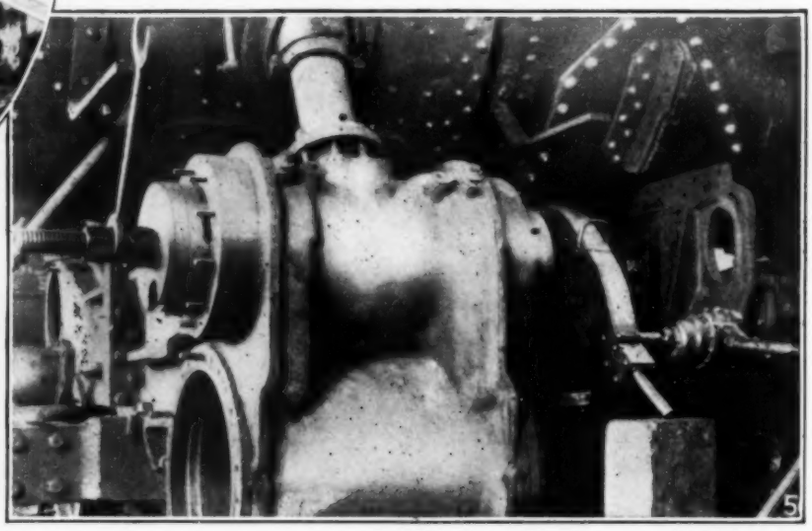


Fig. 5 — Forcing bushings into a valve chamber by an air-driven device. The bushings are started by hand, after which a screw and two plates are assembled to them. The driving unit is attached to one end of the screw, while the overhanging section is supported by a block to prevent turning. The device can be applied quickly and saves considerable time in handling the operation

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Handling the Shop Office

"I'M HAVING a heck of a time in my department office, Al. Notes come in from the main office to the production man or to the inspector, or to the clerks, and these fellows go ahead and send out information that I never see. I hate to bawl out Jones if he is just answering an inquiry from someone higher up. But yesterday he gave the sales engineer a report on the progress of the Maxwell Company's machine, and he didn't have the dope on changes that I am making. Never said a word to me when he wrote the note. Why shouldn't everything come through the foreman, anyway, Al? Don't you think we ought to stick out for that?"

"Yes, and no, Ed. I think you should have sat on Jones pretty hard for not referring the inquiry to you. But I think you'd find it just as bad the other way if you had to squat at your desk and answer all kinds of bug questions."

"But where do we draw the line, Al? I'm the boss of the department, am I not?"

"Certainly, Ed, you're the boss. But handling all the papers and answering all the questions won't leave you much time to do any bossing."

"Then where do I come in, anyway?"

"Well I don't know that I have the problem solved just right, by any means, but I've doped it out for myself along the lines that the company uses at the top."

"How is that, Al?"

"If an inquiry for new work comes in, or some general policy is up that affects the whole plant, you know that the old man handles it himself. He gets lots of advice all along the line, but the final decision and the announcement or acceptance are his personally.

"But, if anybody on the outside writes about our standard product, the sales manager takes care of the inquiry, and if there's anything about buying regular materials the purchasing agent is the fellow who signs the letters.

"That's what I do in my department, Ed. If it's a question of routine—daily production, balance of stock, time cards, or a thousand and one other matters—I let the proper section clerk go ahead. But I insist on seeing all orders for new work, or anything else that affects the regular order of things. And I want to see and sign all weekly reports that go out and all requests to change things."

"Sounds reasonable, Al. Guess I'll think it over."

How should the foreman distribute his office work? Should everything pass through his hands, or is Al right about eliminating the regular routine?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Hiring in the Open

FOR the man who is interviewing an intermittent stream of applicants at the same time that he is endeavoring to carry out his regular business, it is often hard to continue giving a full interview to the man who obviously will not do for the particular job in hand. Under such circumstances, I have found it well to remember that in those 10 or 15 minutes, I am probably giving the applicant the only intimate contact with our organization he will ever have unless I should happen to hire him.

Even though I have to turn him down, I try to do it courteously and with some degree of explanation as to why he will not do. It's such a little effort to be courteous, and it really makes it pleasanter for the man who interviews the applicants.

Unsuccessful applicants, who had been frankly told why they could not qualify, often have sent in the best man ever found for the particular job. A man who may not qualify for a certain job, if courteously treated, will come back again when a job more suited to his qualifications is opened up. After all, is there any easier way to make a friend for the company than by extending to an applicant the courtesy that common sense dictates? This courtesy need not be elaborate or formal—just a straighforward effort to make him feel at ease.

—HARVEY S. HINCHMAN.

Standards for Machine Finishes

A GOOD plan for standardizing machine finishes would be as follows:

Make photographs, magnified five times, of all finishes, such as milled, turned, ground, and lapped surfaces. Grade each of these as finish No. 1, finish No. 2, etc. Put up these photographs in sets and give them to the head inspector of each department, together with a magnifying glass of like power. When starting a new job, the subordinate inspector would take the first couple of pieces of work to his superior, who would check it for finish, and hand it back to the inspector to be used as a standard for the remainder of the job. Such a system would eliminate considerable confusion and also prevent the loss of work due to improper finish. —FRED A. SCHMIDT.

A GOOD mechanic takes pride in his work. His greatest pleasure is in doing a good job. He would resent an order to do otherwise and would, in most cases, turn out his work with a good finish regardless of any such orders. The good mechanic will usually turn out his work with a good finish in less time than a less skilled workman can turn out a rough finish, so why take the joy out of life for him?

The foreman knows his men. If he has any men whom he knows will lose time by producing work with a good finish, he will give them the work that does not require the good finish, and instruct them accordingly. If space is available and the management sees fit to make such an investment for the benefit of the apprentice boys, a set of finish standards will be a good thing for them to study. Outside of this, I fail to see where the firm has anything to gain by having a set of standards for machine finishes. —W. J. OWEN.

ED IS all wrong when he leaves the question of finish to the operator or to the inspector. It is necessary for someone to specify the quality of finish wanted. On production work, the feeds and speeds, which are all worked out, constitute a standard for the finish. In order to insure the standard desired, a sample is usually furnished with the tools.

On job work, the test block idea is very satisfactory. Numbered blocks, finished in the desired manner, are furnished by the customer. The notes on drawings calling for rough finish, etc., really do not mean anything as there is always the question of what constitutes the finish desired. On the other hand, if No. 2 block is called for, everybody understands what is wanted.

—A. C. NOLKE.

IT SHOULD not have taken a special trip for Al to conclude that the question of finishes was one to be taken seriously. The matter has, no doubt, been in his mind for some time, and simply crystallized through his observation.

A drawing is nothing more than an instruction sheet. Until a system of standards for finishes is adopted, our drawing sheet will continue to lack definiteness on this point.

There are several classes of mechanics with regard to finishes. One class fails to take time into consideration and always does a fine piece of work. This class may be under the delusion that saving time does not benefit him.

THE · NEXT · TOPIC

Reading the Shop Language

ADVANCE QUESTION

Ed thinks it is up to every machine operator to be able to read blueprints. Al only partly agrees. What do you think?

The fact remains that production at less cost can be credited with the ever increasing benefits of mankind. Another class lacks the spinal column necessary to decide what is required in finishes, with the result that he continuously bores the poor overburdened foreman with his many inquiries. A third class, the real mechanic, considers the necessity of each and every move as his part in producing a certain job. He wastes no time on frills, and produces his job satisfactorily to all requirements—provided he knows the requirements. Here is the rub that necessitates the adoption of a standard for finishes.
—J. Homewood.

Putting One Over on the Builder

THERE is no question as to which of the two foremen is right in this case. The workman was absolutely in the wrong in trying to "pass the buck" to the planer builder. There is no asset in business that will take the place of good will, and trying to get away with things of this type will destroy good will sooner than anything else. Aside from the aspect of common honesty, all anyone has to do is to think what his own opinion would be of a concern that tried a trick of this kind on himself. He would have nothing but contempt for its executives. There is a great deal of practical business sense, as well as moral sense, in the old adage, "Honesty is the best policy." The concerns we respect most, and the ones we will do most for, in a pinch, are the ones who have shown us by their actions that they are square in all their dealings with us.—James Tate.

Helping the Efficiency Engineer

ONE point in favor of the industrial engineer is that he has come into contact with a wider variety of applications than any man who has spent his years in one or two shops. The nature of his contacts has been such that he has had better chances for getting at the principles behind these applications than would have been the case if the old timer had been allowed to visit around freely. Back of all this, however, is the fact that the average man on the job is likely to believe in leaving well enough alone, and is usually prone to believe that years of contact with a job is equivalent to efficiency. He is too close to the job to observe.

From my own experience, I would say that the best interests of all concerned would be served by a real spirit of co-operation between foremen, management, and men, and the newcomer. Of course, the investigator will inevitably uncover most of the facts, even though the foremen might endeavor to conceal them.
—D. C. Wright.

A FOREMAN'S ability to conduct his department successfully depends upon his ability to accept criticism. The successful foremen are those who listen to criticism, determine which is destructive and which is constructive, and derive from the constructive criticism new methods and improvements which will result in more profits for their company.

When the boss hires an efficiency engineer, it is pretty safe to assume that he has carefully investigated the ability and reputation of the man he hires. It is also a safe bet that he thinks there is room for improvement. Any foreman, who does not wholeheartedly co-operate with the men his boss has picked, is betraying his boss and his fellow employees, because the conditions under which men work and the salaries they earn are directly dependent upon the profits of their organization.
—T. Homer Thomas.

Putting Color on the Machinery

IS AL sure that bright colors for machinery is a new stunt? Years ago, green and red were quite the thing for machines of any description, with a touch of gold to show up the name or fancy design. This practice survives in the case of agricultural machinery, and the home laundering equipment.

Evidently, there is a demand for brighter colors, as a number of the smaller machines such as typewriters, are now available in almost any desired color. These are enameled so that any oil, grease, or dirt can be removed easily with a cloth. —A. F. Guyler, *England*.

FOR three years we have had in our shop four American tools which are painted gray. These machines are really pleasing points in our shop, and I would like to see all machine tools painted in this way. We have found that the operators on the gray machines hold their machines far cleaner than the operators on the black painted machines. However, this nice gray inclines to get poor-looking under the influence of oil and cooling fluids and I think that the paint manufacturers should give us bright colors that will offer real resistance to these compounds. —Franz Bermann, *Austria*.

Paying More to Save Money

ED'S remarks about the engineering department give one the impression that we are too "thick" to receive suggestions on how to save money. In this particular case, where Al accidentally discovers it would pay to substitute brass for steel, the engineering department may have overlooked something. However, we are only too glad to receive suggestions from the shop, especially suggestions of this nature, so that we can be on the lookout for similar savings for the company. —R. J. Gorecki.

Making the New Planers Pay

WHEN new machines are installed in any shop the first thing the operator does is to wonder why the step has been taken. He is suspicious that the management will expect him to work harder for the same pay in order to pay off the cost of the machine. If the price were to be told it would increase his distress. In some instances, the operator will deliberately keep down his rate of production when placed on a new machine in order to influence the management into the belief that a false step has been made in purchasing the machine.

Therefore, the operator should be assured that piecework prices will not be set until he has become familiar with the operation of the new machine. There is then no reason why he should not know the cost of the machine. —R. L. Einnim, *England*.

A Precision Value for the Inch

UNDER the above title Luther D. Burlingame, well known for his interest in and study of problems of measurement, has issued a carefully prepared suggestion that deserves close study by all who deal with close measurements. He takes up the alleged difference between the standards of Great Britain and the United States and points out that the manufacturers of the two countries who have daily dealings with precision standards used in tool and gage work refuse to recognize that any difference exists.

Regarding fundamental standards of length, Mr. Burlingame points out that Great Britain, Canada, the British Commonwealth and the United States do not use the meter or its parts except to a very small extent. The inch, with its decimal subdivisions for precision and fractions for round dimensions, is the almost exclusively used unit for the production of manufactured articles. Moreover, the use of the inch is growing as the standard length unit for manufacture throughout the world and has distinct advantages over metric units of length for this purpose.

The inch, however, the most important unit in the manufacturing world today, has no legal definition. It is a thirty-sixth part of a yard, the length of which is of itself open to controversy. It is proposed to make a precise inch, based on the wave length of the red ray of cadmium now used in determining measurement, which is given as about a quarter of a ten thousandth of the present inch, or approximately 0.000025 inch.

The scientists of Great Britain define the inch as 25.39998 mm., while those in the United States call it 25.40005 mm. The mean is approximately 25.4 mm., which is the value used by manufacturers in converting inches to millimeters where an error in the fifth decimal place is not important, as it seldom is. This figure has been used for years in metric gear cutting with inch threads on the lead screw and vice versa.

Accepting the value of the international meter as 1,553,164.13 waves of the red ray of cadmium, the conversion factor of 25.4 gives the inch as 39450.368902 wave lengths. Calling the standard inch 39450½ wave lengths and the conversion factor as 25.4 mm. to the inch, would, in Mr. Burlingame's opinion, give the inch a precision value and pave the way for complete accord between Great Britain and America as well as bring scientists and manufacturers and the Government departments into a better understanding.

Following this the author recommends the making of precise physical standards for the inch, foot and yard. These could then be used as fundamental standards without conversion from the metric when comparing industrial standards, and also as a basis for any future precision work on length standards.

Making Pencil Tracings—*Discussion*

By Samuel Kauffman

COMMENTING on the article by Albert Conway, entitled Making Pencil Tracings, which appeared on page 243, Vol. 69, of the *American Machinist*, the one great advantage which Mr. Conway fails to mention is the ease with which penciled detail sheets can be made from the assembly or construction drawings. Once a tool or machine is designed and drawn up in assembly, detail tracings can be made quickly by laying a sheet of vellum over the assembly and moving it over the surface of the drawing until the outline of each part is traced off. Detail drawings, under this procedure, are produced in one-third the time necessary when following the old method of drawing up each piece separately.

Disposition of Obsolete and Inactive Patterns

THE storage of patterns is a serious item of expense to most manufacturers and the general practice seems to be to destroy them only when forced to do so by crowded storage facilities.

The habit of catering to a customer's good-will by assuring him that he "can get replacements or repair parts from us any time" is a rather extravagant promise if, as in a specific case by no means unusual and perhaps typical, some fifteen acres of space be devoted to pattern storage with a book value of land and buildings of $1,586,420; to say nothing of the expense of fire protection, continuous clerical service, and other items.

In determining a policy, three important things should be considered:

1.—The value of patterns, based on: (a) frequency of use; (b) first cost; (c) cost of storage. If a pattern is infrequently used, it has comparatively little value, regardless of its first cost. On the other hand, if it is an expensive pattern which there is a chance of using (perhaps with some change on future work), its prospective value might offset the cost of storage.

2.—Obligation to customers.

There is at least an implied obligation to furnish repairs at reasonable cost during the so-called normal life of any standard machine, but if repair orders over a period of years cover only certain parts, the balance of the patterns could be destroyed. In the case of special machines not likely to be duplicated, the patterns could be destroyed at the end of the guarantee period, following notification to customers so they may order spare parts if wanted. A customer may elect to purchase the pattern.

3.—Cost of storage.

Striking a balance between the "going value" of a pattern and the cost of storing it should determine whether it be kept or destroyed.

A study of this problem was made by a competent committee of The Machinery Builders Society. The report of the committee proved so convincing that the following standard rules of obsolescence were adopted:

1.—All patterns, jigs and fixtures which are special for a job and not likely to be used again are to be scrapped at the end of the guarantee period.

2.—All other patterns, jigs and fixtures that have not been used for a period of five years are to be scrapped.

3.—The customer is to be charged with the cost of replacing any of the above that have been destroyed after the stated period, being advised of this fact when he orders repair parts.

These are not hard and fast rules but are recommended as fair to all concerned. They provide a "reasonable standard" to which a customer's attention may be directed if he feels he has been arbitrarily treated with respect to scrapping a pattern after a reasonable period of inactivity.

Precision Grinding of Small Parts

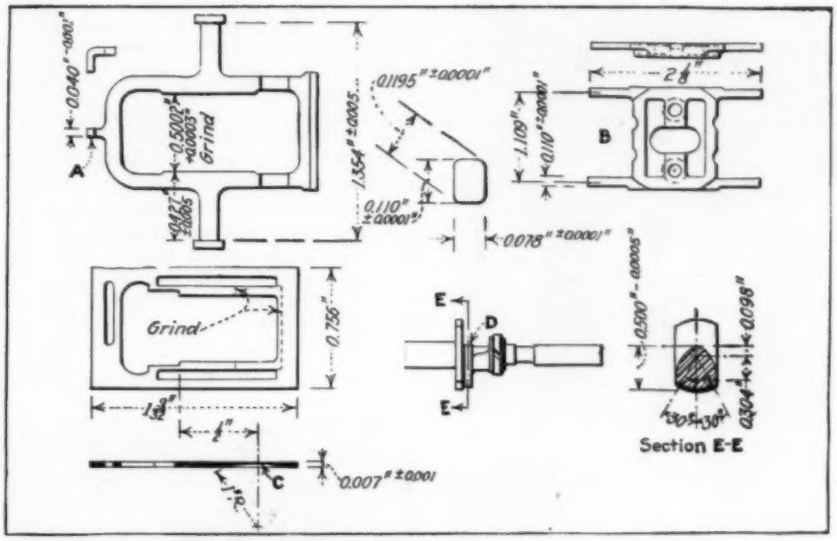


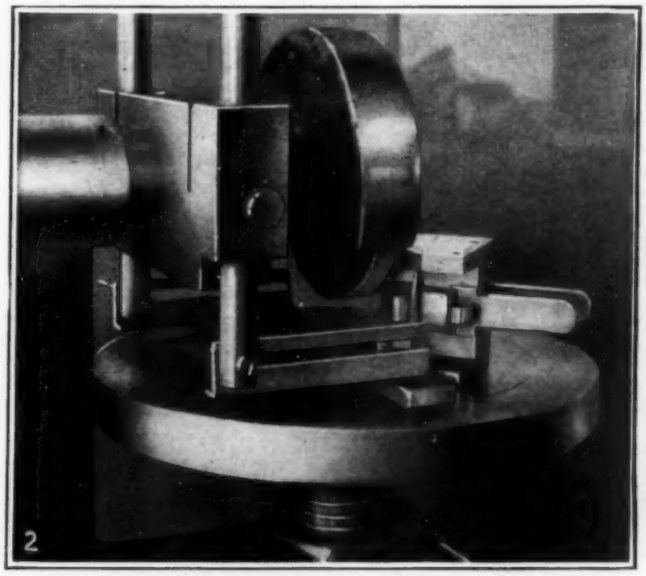
Fig. 1—Several small parts requiring grinding operations

By Frank W. Curtis
Western Editor, American Machinist

MANY parts used in the construction of Filmo moving-picture equipment made by the Bell and Howell Company, Chicago, are small in size and require unusual precision in their manufacture. Grinding as a means of finishing is used extensively. On account of the nature of the parts, the grinding equipment consists of many small machines, some of which are of the bench-type, equipped with well-devised operating features. Representative examples of some of the parts ground are illustrated in Fig. 1, and among the operations performed are surface, cylindrical and internal grinding.

Grinding the shuttle finger, shown at *A* in Fig. 1, is handled in a surface grinder developed at the plant especially for finishing small pieces that can be clamped in a fixture and passed under the face of the abrasive wheel. The set up is shown in Fig. 2. The shuttle is located and clamped in the fixture centrally, that is, the distances from the center line of the work to the upper and lower faces of the fixture are equal, in order that both sides of the finger can be ground at one setting. In this operation the faces of the shuttle adjacent to the finger are cleaned up by the side of the wheel, therefore, a guide plate mounted on the spindle housing is used to limit the width of the surface being ground. The guide plate is adjustable to compensate for wheel wear. Movement of the work vertically is attained by revolving the work table, the shank of which is threaded to fit the machine base. The operation is handled by raising the table slightly and grinding one side of the finger, after which the opposite side is ground at the same setting.

The fourth article of a series. The fifth will appear in an early issue.



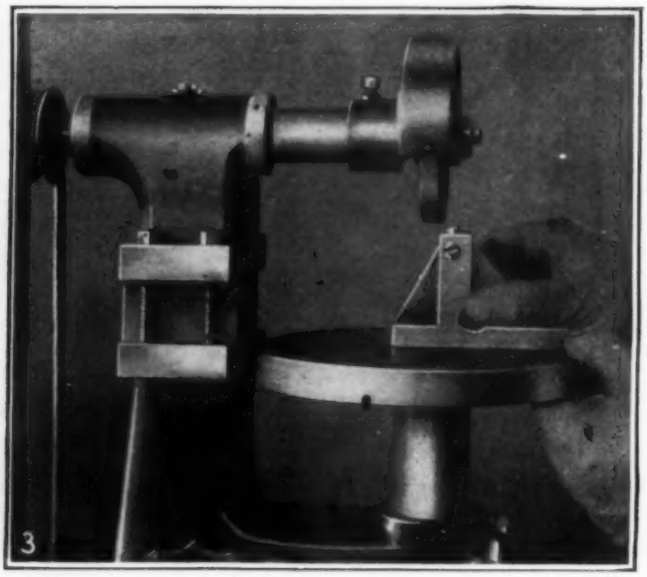


Fig. 2—Grinding both sides of a finger in a machine developed for the surface grinding of small parts. The work is clamped in a fixture centrally and has both sides ground at one setting by merely reversing the position of the fixture. The table is mounted on the machine base by a threaded shank, so that vertical adjustment is made by turning the table in the directoin desired. Fig. 3—Another view of the grinder, showing how the abrasive wheel is dressed. The diamond mounting is fastened to a fixture that is passed backward and forward under the wheel face. Graduations on the outer face of the work table and a pointer are used as a setting

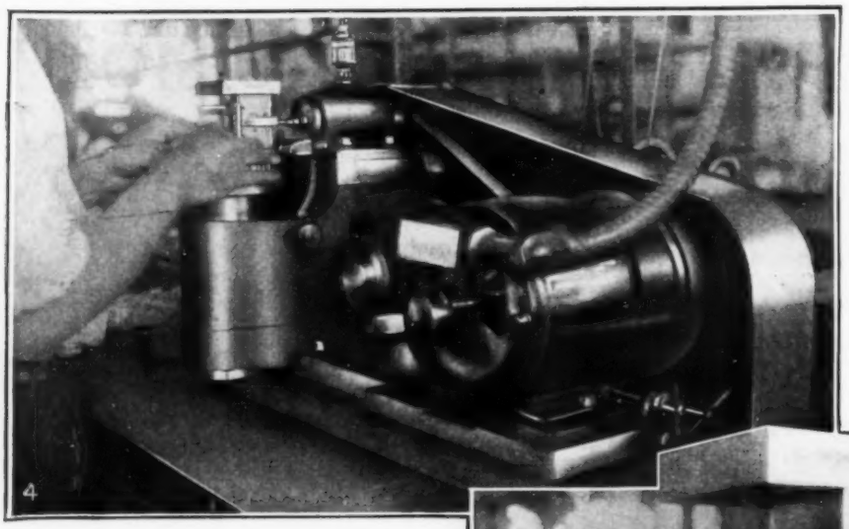


Fig. 4—A bench-type grinder used for surfacing the inner faces of shuttles. A $\frac{1}{8}$-in. wheel mounted on the spindle runs at 25,000 r.p.m. and is driven by a $\frac{3}{4}$-hp. motor. The work is clamped centrally in a fixture, so that both faces can be ground at one setting. In use, the fixture is placed against a guide bar and is moved crosswise between two adjustable stops

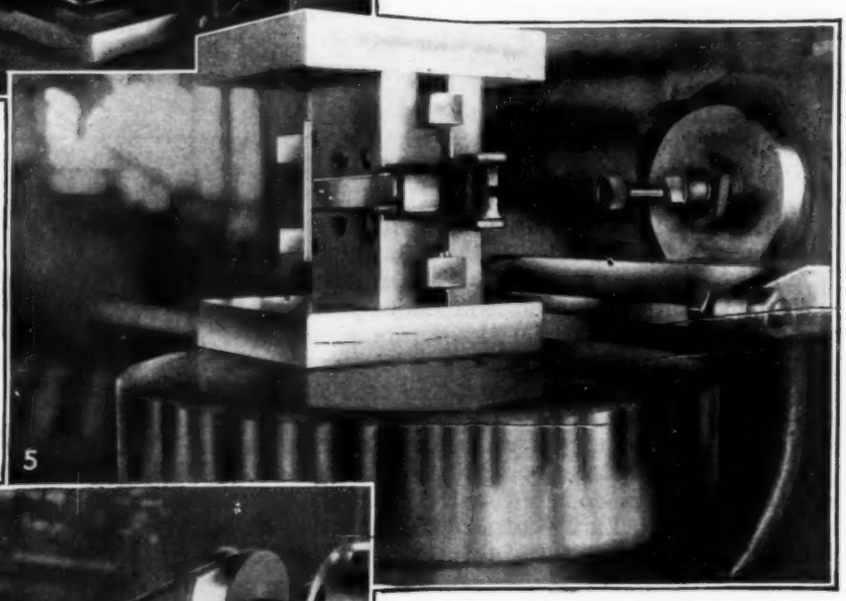


Fig. 5—A near view of the fixture showing a piece clamped in place. After one side has been ground, the fixture is turned up-side-down for the finishing of the opposite side. The guide plate against which the fixture rests, is oscillated slowly in order that nearly the entire face of the wheel comes in contact with the work. The distance across the faces is held to a tolerance of 0.0003 in. for a length of $\frac{3}{16}$ in.

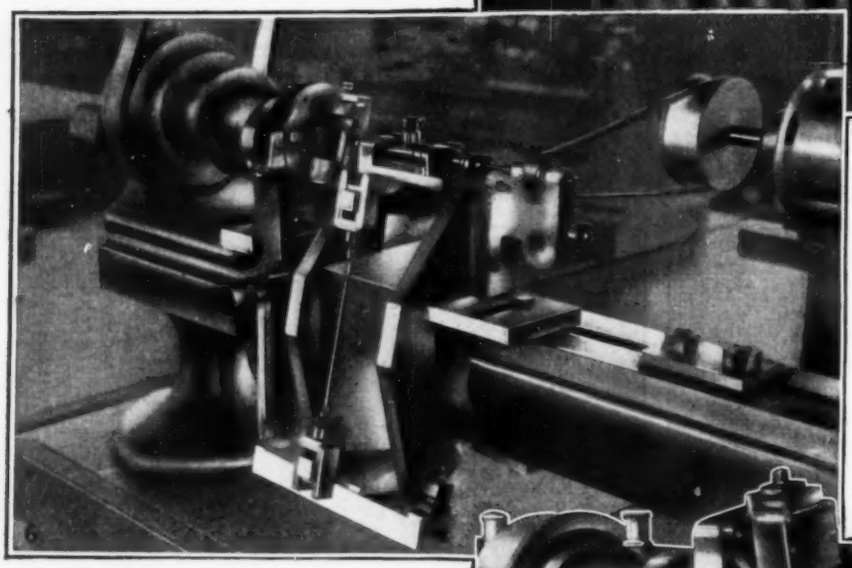


Fig. 6—A grinding machine made from a bench-type lathe. It is used in grinding three sides and four corners of perforator-punch legs. The grinding wheel spindle travels in an irregular course to perform the operation. The movement is actuated by a master cam attached to the spindle nose of work spindle, and a roller equipped arm connected to the grinding spindle bracket. The legs are lapped at the grinding, inasmuch as most of the dimensions are held flat

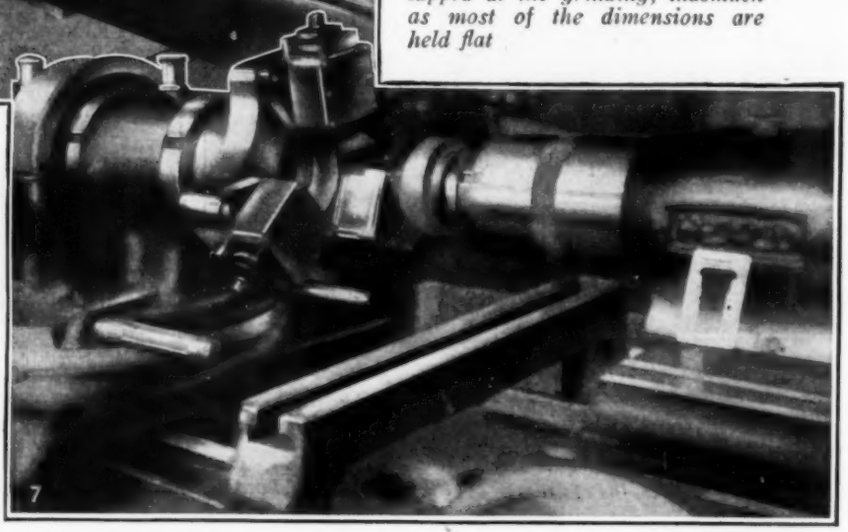


Fig. 7—Grinding a 1-in. radius in three pieces at one setting. The faceplate fixture is equipped with three holding devices, each of which clamps the work by two jaws. The jaws are operated by screws having two collars, between which the ends of the jaws are confined. The work is 0.02 in. in thickness, and the radius is ground to within 0.007 in. of the back face

Graduations on the periphery of the table and a pointer attached to the machine frame are used to determine the proper setting. The fingers are finished to $0.04\ ^{+\ 0.000}_{-\ 0.001}$ in., the size being checked by a limit snap gage. The material is 0.6 — 0.7 carbon, cold-rolled steel which has been previously hardened. Approximately 0.005 in. of metal is removed from each side.

Abrasive wheels for this type of grinder are dressed by a diamond as illustrated in Fig. 3. The diamond mounting is held in a cast-iron fixture that is passed backwards and forwards under the wheel face. For some operations special fixtures are used, the height of the point of the diamond being equal to the height of the face of the surface to be ground, so that after the wheel has been dressed the pointer can be set to the proper graduation on the table.

Two Surfaces Finished at One Setting

The inner, flat surfaces of shuttles, on which a cam operates, are ground in the bench-type machine illustrated in Fig. 4. A feature of the operation, similar to that of grinding the finger, is that the work is clamped centrally in a fixture, thus enabling both surfaces to be finished at one setting by merely reversing the position of the fixture. Driven by a $\frac{3}{4}$-hp. motor, the grinding wheel runs at 25,000 r.p.m. A close-up view of the fixture, showing a $\frac{3}{8}$-in. abrasive wheel attached to the spindle is illustrated in Fig. 5. In operation, the fixture after being loaded is located against a guide plate and is moved crosswise between two stop screws. This action permits the surface of each inside face, $\frac{9}{16}$ in. in length, to be ground without the wheel interfering with the ends, which are relieved to provide sufficient clearance. In order that the entire face of the wheel may come in contact with the work during the operation, and to avoid uneven wear, or wearing a ridge in the wheel, the guide plate is reciprocated slowly in the direction of the axis of the spindle. This movement is actuated by a cam driven by worm gearing. The distance across the faces is held to $0.5002\ ^{+\ 0.0003}_{-\ 0.0000}$ in., and is checked by a bar gage.

Grinding the legs of the perforator punch, shown at *B* in Fig. 1, is done in the bench grinder illustrated in Fig. 6. The machine is constructed from a bench lathe and is equipped with a work-holding fixture, and a small grinding spindle that is operated by a cam so as to grind the work on three sides and on four corners. The punches are made of oil-hardening steel and are tempered before being ground. The distance across the corners and the thickness between the sides ground opposite to one another, are held to ± 0.0001 in. Clamping of the work in the fixture is arranged so that after one side has been ground the work is relocated for finishing the opposite leg. Here again close tolerances are required, inasmuch as the distance between the legs is held to ± 0.0002 in. A cam on the nose of the spindle engages a roller attached to an arm fastened to the wheel-spindle bracket, thus causing the wheel to travel in a path controlled by the cam, and likewise to grind the leg to the desired form. Due to the accuracy required, the wheel-spindle housing and the bracket are covered by a canvas hood and a sheet-metal frame to prevent abrasive dust from collecting on the operating surfaces. The final operation performed on the leg is lapping, since most of the dimensions must be held accurately to size.

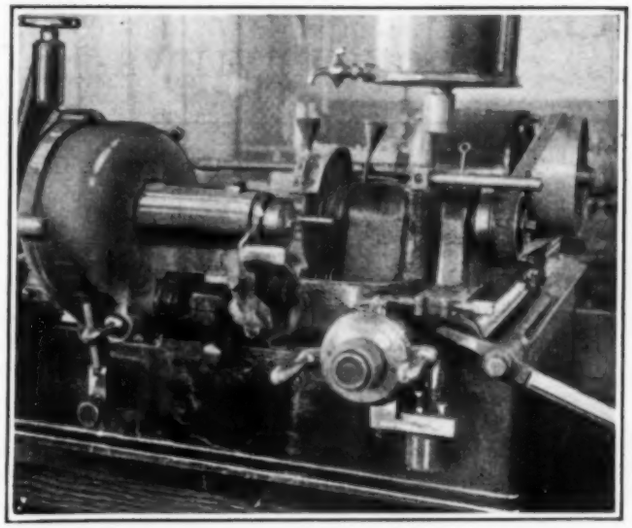


Fig. 8—Grinding the cam for a projector shuttle-shaft is done in a bench-type grinding machine equipped with a wheel wider than the face of the work, so that the work can be done by feeding the wheel toward the work. The work spindle is mounted in a pivoted housing

In grinding the 1-in. radius of the shuttles, as shown at *C* in Fig. 1, the operation is handled in a machine in which three pieces are set up at one time. The fixture, mounted on the work-spindle nose, has three clamping blocks equally spaced and attached to it as illustrated in Fig. 7. Each piece of work is located in a block by its center opening and is held in place by two flat jaws operated by a screw such as shown at *S*. The shuttle, made of spring steel, is 0.02 in. in thickness and the radius is ground to within 0.007 in of the back face.

The cam on the projector shuttle-shaft, shown in Fig. 1 at *D*, is ground in a bench-type cylindrical grinder equipped with a cam grinding attachment. The machine, shown in Fig. 8, is special in construction having been built especially for the operation. A collet chuck holds the work, while its radial location is governed by a previously-machined flat on the shaft that fits against a hardened locating block on the face of the collet. The width of the wheel is slightly greater than the face of the cam, and the grinding is completed by merely feeding the wheel forward to a stop. The work spindle is mounted in a housing that is pivoted in order that it can oscillate in relation to the shape of the cam being ground. The movement of the housing is controlled by a large master cam attached to the rear end of the work spindle which bears against a hardened roller. The contacting pressure of the two cam faces is by a leaf spring. Previous to being ground, the cam is milled and hardened, leaving from 0.006 to 0.007 in. of metal to be removed by grinding. Its face is $\frac{7}{64}$ in. in width, and the tolerance in grinding is 0.0005 in. A soluble-oil compound, used as a cutting lubricant, is fed directly to the face of the cam by a funnel attached to the wheel guard.

Many other accurate grinding operations, in addition to those illustrated, have been developed for a number of additional parts. By manufacturing these units to close tolerances, the assembly has been somewhat simplified, in that the pieces fit together without difficulty. In addition, the finished product is better from the standpoint of the operating man.

· BOOK · REVIEWS ·

THE COST OF LIVING IN TWELVE INDUSTRIAL CITIES. Published by the National Industrial Conference Board, 247 Park Ave., New York City Seventy-six pages, 9x6 in. Cloth boards. Price $1.50.

THIS volume contains the results of an investigation conducted by Miss F. B. Brower and assistants of the National Conference Board's Research Staff between August and October of 1927 in twelve representative American industrial cities. Three classes of cities were selected; large cities which included Boston, Cleveland, New York and Philadelphia; medium cities which included Dayton, Reading, Springfield and Syracuse; and small cities which included Butler, Leominster, Lockport, and Marion.

In each of these cities data were collected concerning retail food prices, housing costs, cost of fuel and light, clothing prices and sundries. The interesting fact disclosed in the summary and conclusions is the small difference of $4.19 found between the highest and lowest weekly living cost of the twelve cities investigated.

Two appendices are included, one containing a list of the neighborhoods visited and the other various tables showing budgets and comparing items of living costs in the various cities.

COMMERCE YEARBOOK, 1928, VOL. 1—UNITED STATES. —Seven hundred and eight pages, 6x9 in., heavy cloth board covers. Indexed. Compiled by the Bureau of Foreign and Domestic Commerce, and sold by the Superintendent of Documents, Government Printing Office, both at Washington, D. C. Price $1.25.

THIS cyclopedia of American commerce opens with twenty-eight business barometers, and an eight-page summary of the year 1927. Following this come seventeen sub-divisions covering such subjects as production, employment, and domestic trade; foreign trade; construction; machinery; and automotive products. Each subject is covered by charts, tables, and description in the most thorough manner. The twenty-four page section devoted to machinery is sub-divided as follows: general aspects, industrial machinery, railway locomotives and cars, electrical equipment and materials, and agricultural machinery and equipment. The final section covers "Noncontiguous Territories of the United States," such as Alaska and Hawaii.

STANDARDS YEARBOOK, 1928. Miscellaneous Publication No. 83 compiled by the National Bureau of Standards. Three hundred and ninety-nine pages, 5½x9 in., indexed. Cloth. Sold by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Price $1.

IN THE metal-working industry those responsible for the functions of management, design, production and plant operation must realize to the greatest possible extent the value of standardization. In most cases such persons are eager to obtain the benefits, but are not aware of the source of complete information about what has been done, or what is going to be performed in the future, along this line. Doubtless if the industry as a whole makes complete use of these facts as they become available, this country's progress will never lag behind that of any other.

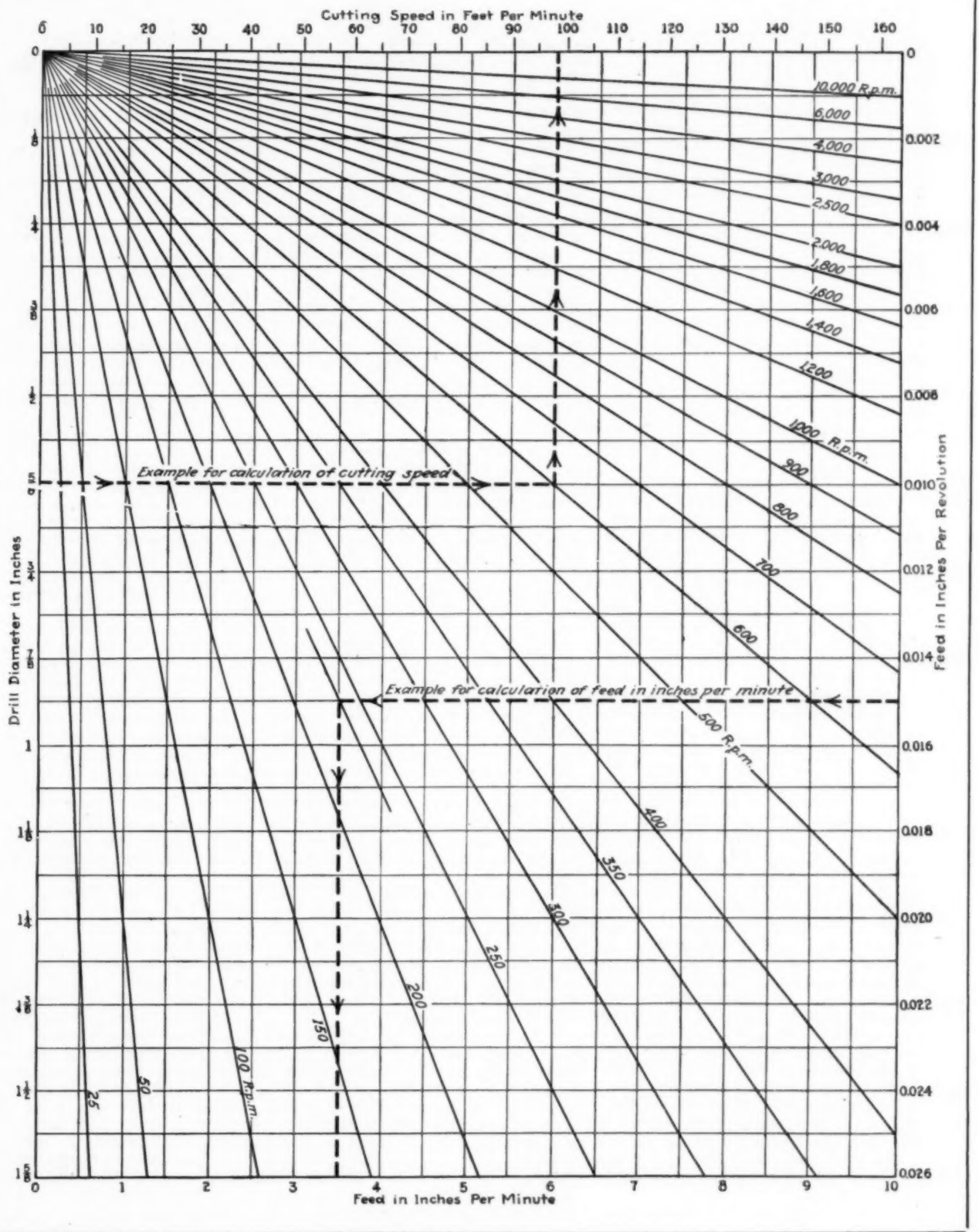
Few persons are aware of the scope of standardization at the present time. Much valuable enlightenment can be obtained from the two volumes published by the National Bureau of Standards. In a previous volume attention was directed principally to the organization and procedure of our own standardizing agencies The present work contains outlines of the activities and accomplishments of not only the National Bureau of Standards and other agencies of the Federal Government and the States, counties and municipalities, but also those of technical societies and trade associations, with special emphasis on their accomplishments during the year 1927 and their programs for future work.

KINGDOM OF THE SERBS, CROATS, AND SLOVENES. A Commercial and Industrial Handbook. By Kenneth S. Patton, American Consul at Belgrade. Published by the Bureau of Foreign and Domestic Commerce, Washington, D. C., and obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 85 cents. This 261-page, cloth-bound book is No. 61 in the "Trade Promotion Series" of the Department of Commerce, and well merits attention on the part of any manufacturer who is seeking to sell his product in Yugoslavia. It is a very well-arranged text on the pertinent facts that affect trade conditions in that country, including brief résumés of the geography and of the political, financial and social conditions. It is well illustrated, and has a large number of tables. The various manufacturing industries are taken up separately.

NEMA HANDBOOK OF APPARATUS STANDARDS, formerly known as the Electric Power Club Handbook of Apparatus Standards. This 348-page edition is published by the National Electrical Manufacturers Association, 420 Lexington Ave., New York City, and sells for $3.00 postpaid. The book embraces standards of electric power, control and measuring apparatus for the generation, distribution and utilization of electric energy. Each section of the handbook, covering such apparatus as motors and generators, industrial control, transformers, switchgear, measuring instruments, electric welding, etc., is complete in itself, all the rules relating to each product being grouped together. Standard definitions, abbreviations and symbols are also included for each class of apparatus, as well as a discussion of business policies and the customer's obligations. Such a text is a valuable guide for the equipment purchaser and builder.

The Bureau of Foreign and Domestic Commerce during the next fiscal year will start work on three new regional surveys in the national commercial survey program which is planned ultimately to cover the entire United States. The "Commercial Survey of the Southeast" has already been completed and is available at $1 per copy from the Superintendent of Documents, Government Printing Office, Washington, D. C. Field work in the New England survey has been completed and that on the Pacific Southwest is well under way. Preliminary steps have also been taken in connection with the Mid-West region. The three new regions to be undertaken are the Gulf States, the Central Atlantic region and the Pacific Northwest.

Speed and Feed Chart for Drills



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· TECHNICAL · ABSTRACTS ·

Apparatus Analysis

When apparatus must not only satisfactorily perform its work but give service over a number of years at a minimum cost, its design must involve not only the arrangement of parts to perform a desired end but a detailed study of each element of the apparatus.

Apparatus analysis requires of those who practice it extensive and detailed knowledge of both mechanical and electrical elements. The strength of a machine screw, to take an elementary example, and the force with which it holds two parts together with a given tightening torque, depends not only on its size and the material of which it is made or with which it is plated but on the size, type, and pitch of its threads. A detailed knowledge of the duty cycle to be required of it must be checked against the various types and sizes of screws available if the best overall results are to be obtained.

Not only must a screw be chosen for its strength and the force it exerts, but the likelihood of its loosening in service must be carefully considered. It is held in place by friction which depends not only on the coefficient of friction but on the total force on the threads and clamped surfaces. This must be given the most careful consideration as it changes during the life of the equipment due to many factors such as the external forces exerted during the operating cycle, the loss of resiliency of the screw and of the clamped materials, temperature changes, and vibration which is a particularly fatal enemy of stable assembly.

The apparatus analyst must make certain that a spring shall exert sufficient force but yet not too much, or unnecessary wear or shock will result to the apparatus. The amount of movement the spring must make, the number of times it must operate, and the temperature changes it must undergo are all factors that vitally affect its design both as to form and material. So important is this matter of raw material that special laboratory raw material specifications are now issued to insure satisfactory and uniform products.

Other mechanical design elements of paramount importance are bearings. Type of bearing and method of lubrication both raise an almost endless series of questions to be answered. The speed for which a bearing is designed is always an important factor. This is particularly true of ball bearings which require, for instance, a certain minimum speed of rotation to keep the balls rolling in the center of the race. If they are specified where the speeds are below this value, excess friction between the balls and the containing cages accelerates the wear of the bearing.

A very important part of apparatus analysis is life testing. An allied function is the investigation of trouble in the field. In addition the Apparatus Analysis group is instrumental in investigating changes proposed by the Manufacturing Department and as a result recommends many modifications to facilitate manufacture and to lead to cost savings that do not otherwise affect the design. Also they specify limiting conditions or tolerances such as hardness of metals, spring forces, contact pressures, or the required tolerances for resistances, voltages, or other constants

For the best results it is desirable to have the two groups work together from the beginning of a design. Occasionally the completed drawings are submitted for analysis and at other times models are used for the studies. Tool-made samples come to the Analysis group as an established procedure and form the final basis of analysis.—H. L. Coyne, *Bell Laboratories Record,* August.

Heat-Treatment of Drop Forged Brass

The quality and mechanical properties of the finished drop forgings depend upon the heat-treatment to which the alloy has been subjected under extrusion and before drop forging. The alloys extruded contain up to 58 per cent copper, 2 per cent lead and the balance zinc. The lead is added to increase the machineability. In the manufacture of drop forgings from extruded bars, it was found that some drop forgings had perfectly smooth surfaces while others made from the same bar had rough surfaces. Microscopical examination revealed that the perfect drop forgings had a fine-grained structure while the poor forgings had a very coarse grain structure.

In the manufacture of bars and extruded shapes, three different zones of crystallization can be observed along the length. On account of different rates of cooling, extrusion of the last part of the bar or the third zone had evidently taken place at a temperature below the transformation line. The process at that section of the bar was, therefore, a cold pressing of a needle formed of alpha plus beta crystals, and the result was a break down of the needle form into a ground mass of beta crystals in which globular alpha crystals were imbedded.

In order to remove these differences in grain structure before forging, the bar can be heat-treated to obtain a homogeneous needle-formed alpha plus beta structure, by annealing at a temperature above the critical temperature of transformation. It must be noted, however, that the transformation of globular alpha plus beta crystals into needle-formed crystals does not occur in the same annealing time and at the same temperature for bars of different size and different deformation. These values must be worked out for each shape used.—R. Hinzmann, *Fuels and Furnaces,* August.

Foremanship Training by the Conference Method

It is evident by experience that the progressive, alert, ambitious worker of today is the foreman of tomorrow and the executive of the future. Industrial management should lend a willing hand in establishing a progressive road for the ambitious employees to reach the goal of real executive leadership. Hence foremen education includes not only reinforcing the ability of a department head, but also instructing the future executive.

The plant conference has great possibilities for doing this industrial training provided it is operated under the guidance of a trained conference leader. Many conferences are not successful due to untrained leaders. A conference leader must be a leader himself, know how to set up a foremanship course, and how to plan individual conferences.

In one hour the good leader can pull from a group of foremen more real industrial and practical knowledge of a topic than can be found in any book on the subject, assuming that it is familiar to the foreman. If the topic is not familiar to the foreman, then it is poorly chosen and the conference is a failure. The conference method is predicated on the assumption that the foremen know the answers, and the leader's job is to draw them out. Some conferences have set up foremanship courses for themselves, and the courses have been faithfully followed. Perhaps the reason for the success of this idea is that the men have a voice and influence in deciding what they shall use in their meetings.

Under trained leadership the conference is more effective than the average question box used in many plants. The foremen of a plant know the solutions for many of the difficult production problems in their plant, and are willing to make contributions for these solutions if approached properly. If the leader tries to expose the mistakes and weaknesses of the foremen, the conference will be a failure as no foreman relishes an exposition of his weaknesses before his fellow foremen. The plant conference is an effective means for developing co-operation among foremen and for getting them better acquainted with each other. They learn that the other fellow has his troubles, and is not such a bad fellow as they had suspected. They learn that through co-operation their jobs are easier to handle, and there develops a spirit of loyalty and team work. —R. W. Jenkins, *The Foremen's Magazine,* August.

IDEAS · FROM · PRACTICAL · MEN

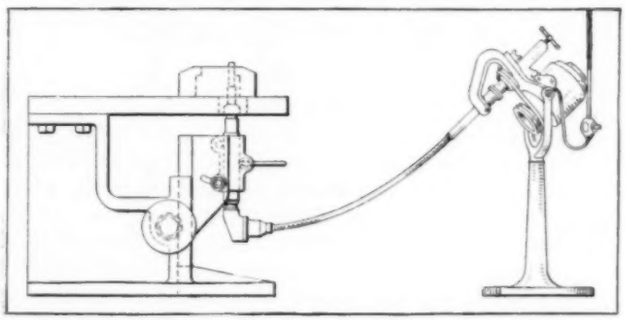
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

A Handy Device for the Diemaker

By Wallace C. Mills

Needing a device for grinding the irregularly-shaped openings in dies, we made the fixture shown at the left in the illustration. It was used in combination with a flexible-shaft grinder, shown at the right, which we purchased complete with the grinding wheel and the sleeve for holding the shaft. The fixture consists of a base, a stationary table and a vertical slide in which is a clamp for holding the sleeve of the shaft. The table can be raised or lowered by means of a rack and pinion, and the clamp can be swiveled to bring the wheel to the proper angle for grinding the clearance on the sides of the dies.

For grinding punches, the fixture is turned upside



Grinder for dies and punches

down and the table rests on the bench. The punch is placed on what was formerly the under side of the table, and the slide is moved to bring the wheel in position to grind the punch from above.

Staples for Holding Paper on Drawing Boards—*Discussion*

By Roger Williams

In the last few issues of the *American Machinist* I have read with interest the various methods suggested for holding paper on the drawing board. After many years of experience as assistant chief draftsman, I have come to the conclusion that the use of gummed stamp hinges is the quickest and safest way of holding paper. The hinges can be purchased by the carton and each draftsman supplied with a small box.

Considering speed, the use of hinges is superior to the use of gummed cloth stickers, in my opinion, because the gummed cloth comes in rolls of varying width, and the necessity of cutting the rolls into strips of the proper width is eliminated at the outset.

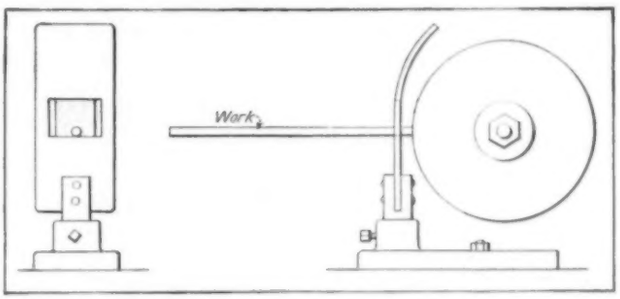
When we consider the safety factor, however, we realize the advantage the gummed stamp hinges have over the staple and the thumbtack for this purpose. Where drafting machines are used, it is easy for the edge of the scales to get underneath the paper. When a drawing that is being held by gummed hinges is caught by the scale or T square, it is not torn but merely lifts its fastening from the board and is immediately put in place again by another hinge. In a drawing room, where many tracings are made every day, this saving counts greatly and speed is combined with safety to make our loss from torn drawings negligible.

A Work Guard for the Grinding Stand

By Harry Moore

Hamilton, Canada

Rough grinding the ends of rods, bolts or similar parts, soon wears a groove in the center of the face of the abrasive wheel, because the operator is naturally afraid



A work guard

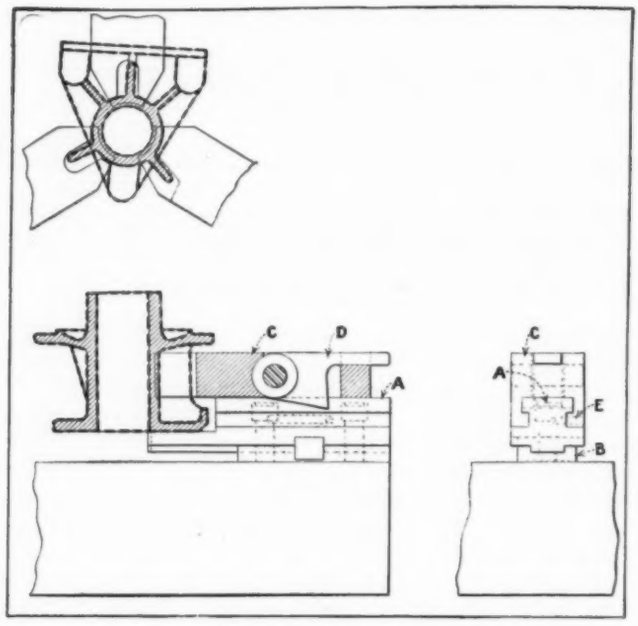
to take the work too near the sides of the wheel for fear it will slip off. The illustration shows a handy guard for jobs of this nature, consisting of a piece of heavy sheet metal let into a piece of round stock that fits the tool rest. A square hole, slightly wider than the wheel, allows the rods to be moved from side to side without danger of their slipping off, thus enabling the wheel to be worn evenly and the work to be done more quickly. The top part of the guard keeps the dust away from the operator's face.

Quick-Acting Chuck Jaws

By Harry W. Morgan

In chucking our steering gear housing supports, their shape makes it necessary for the chuck jaws to hold them between the flanges, and for the jaws to be cut away so as not to interfere with the stiffening webs.

While ordinary false jaws attached to the master jaws,



Quick-acting false jaws for a chuck

and cut out to clear the webs, would have answered the purpose, the jaws would have had to be opened the maximum amount to permit loading and unloading. To save the time necessary for moving the jaws over so great a distance, we designed false jaws and slides, one of the assemblies being shown in the illustration.

The slide *A* is attached to the master jaw *B*, while the false jaw *C* is held in position on the slide by the pawl *D*, which engages in a notch. The false jaw is prevented from coming off of the slide by the stop *E*. To release the work, the master jaws are opened about $\frac{1}{8}$ in., the pawls are lifted and the false jaws are slid back to the stops, leaving the work clear for removal. The chuck is then ready for reloading. For clamping the work, the operations are reversed.

Template for Stock Lists on Drawings—*Discussion*

By John F. Hardecker

The steel template for ruling lines on the drawing in preparing a stock list, described by J. E. Fenno on page 168, Vol. 69, of the *American Machinist*, is very interesting. An alternative method of accomplishing the same result, and which is considerably easier and cheaper when a large drafting force is involved, is based on the use of a blue-line blueprinted template form.

The first step is to prepare a single ink tracing of the template form. A vandyke is made of this, so that from this vandyke any number of blue-line blueprints may be made. The vandyke is not absolutely essential except that a blue-line blueprint, with the white background, is easier to work with than a regular blueprint.

These blueprint templates are used by slipping them underneath the proper location on the tracing on which the stock list is to be added. The spacing of the template is made large to encourage large lettering on the tracing, which results in a blueprinted stock list that remains legible under the grease and oil of the shop. The large spacing serves a second equally important function, in that it eliminates the necessity of tracing through the template lines on the drawing. With plenty of space, the stock list is sufficiently spaced by following the template without lines. An additional time saving is the elimination of the need to count the number of items of a stock list in advance, since without lines on the drawing proper, items are added directly as they are picked off until all are accounted for.

An Improved Nut Rack for the Erecting Shop—*Discussion*

By P. H. Pearson

On page 169, Vol. 69, of the *American Machinist*, there is an article by L. L. Locke describing a nut rack. It seems that this rack is rather inconvenient, for in order to remove the nuts, one must push the nut up the rod and through the top plate with one hand and remove it with the other.

A rack, the construction of which is similar except that tubes take the place of rods, would be much more convenient. These tubes would be slightly larger than the corners of the hexagon nut and welded to the top plate. They should not reach the bottom plate, but leave an opening slightly more than the thickness of the nut. The nuts can then be dropped into the tubes, the weight of the upper ones keeping the bottom one in place, and removed at will.

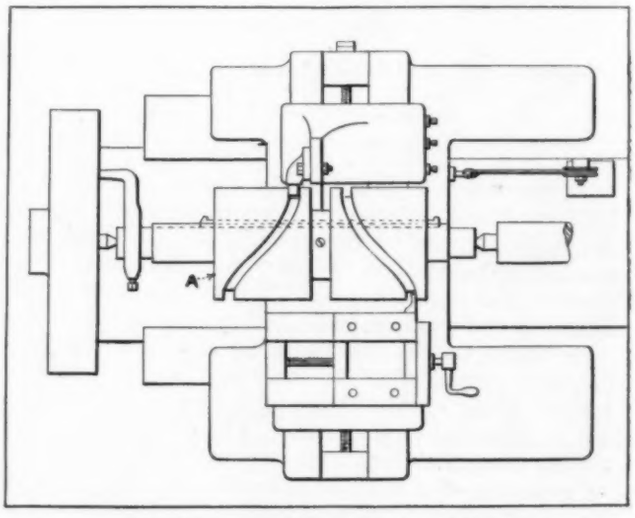
An Improvised Cam-Cutting Attachment—*Discussion*

By R. G. Hewitt

Keighley, England

In an article under the title given above, on page 744, Vol. 68, of the *American Machinist*. John R. McDade described an ingenious device for cutting cams, which, while it might prove satisfactory for cutting one cam of a certain throw, would not be suitable for repetition work. The length and the possible spring of the connecting rods, or any end play in the spindle or backlash in the carriage movement, would tend to make the cam inaccurate.

The arrangement shown in the accompanying illustration would overcome these difficulties. The master cam *A* and the blank to be cut are mounted on an arbor, being separated by a spacing collar and held by keys. The regular follow rest is equipped with a bracket carry-



Device for cutting cams in a lathe

ing a cam roller, and is utilized for imparting reciprocating motion to the carriage. The roller engages the groove of the master cam, and a weight attached to the carriage by a wire rope passing over a pulley, keeps the roller in contact with one side of the cam groove. The longitudinal and transverse adjustments of the tool are made by the feed screws of the compound rest and the cross slide, respectively.

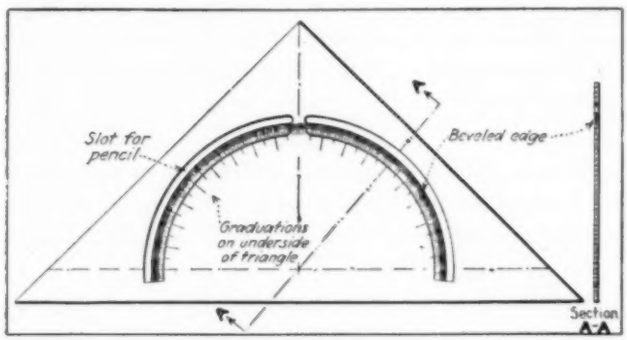
The attachment is simple in construction, low in cost, and can be assembled in place in a short time.

A Protractor Triangle

By Morton Schwam

In laying off and drawing angles, the draftsmen ordinarily has to use two instruments, the protractor and the triangle. The protractor triangle shown in the illustration is a combination of both instruments.

The protractor is graduated on the under side of the triangle, and has two slots cut almost around it, one on



Protractor triangle

each side of the 90-deg. mark. The outer edge of the working face of the protractor is beveled to increase the accuracy with which the angle may be laid off, by having the edge as close to the drawing as possible. Since the bevel and the graduations are on opposite faces, the bevel does not cut off any part of the graduations. The slots provide room for the pencil in laying off angles.

Preventing Cracks in Deep-Drawn Sheet Metal

By Henry C. Franklin

We recently had trouble with cracks in deep-drawn sheet-metal oil pans. The metal seemed to flow without difficulty and no cracks appeared on the samples that we took direct from the press to the bench for examination. When the run was started and the work dropped on the floor, however, cracks would appear in quite a large percentage of the pans. But the cracks did not always show up until a day or two later.

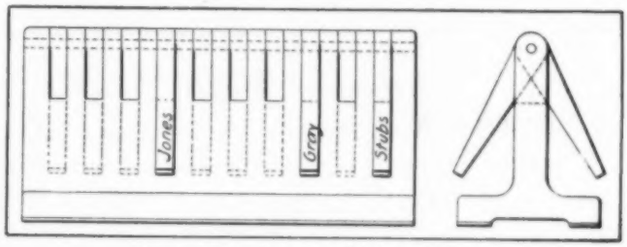
After studying the job we decided that the metal was stressed to a critical point by the deep draw. The shock of dropping the pieces on the floor was apparently enough to fracture the already highly-stressed metal. Taking care not to drop the pans but to lay them on a bench, removed practically all of the trouble. After a few days they could be dropped on the floor without damage. Annealing would have prevented the cracking, but we did not want the pans soft.

Have others had the same trouble?

A Reminder for the Department Head

By J. E. Fenno

In nearly all drafting rooms, it is customary when one of the men wants his drawing inspected or is ready for another job, for him to go to the chief's office to report.



A reminder for the chief draftsman

The chief may be out of his office or he may be busy and not able to give immediate attention to the matter.

To call the chief's attention to any of his men who need him at their boards, the device illustrated would be a convenient part of his desk equipment. The inverted T-shaped base is an iron casting and has felt pads glued to its feet. Wooden arms, each bearing the name of a draftsman, on both sides, are pivoted at the top of the casting and can be swung to either side.

If the chief is busy, or is not at his desk when a draftsman calls upon him for attention, the draftsman reaches for the arm bearing his name, and swings it from the back to the front, bringing his name where the chief can see it. As shown in the illustration, Jones, Gray and Stubs need the chief's attention. After the chief has attended to the needs of these men, he swings the arms to the rear, in which position the names are hidden from his view by the vertical member of the casting.

Making Erasures on Tracings
Discussion

By Charles J. Tuttle

I was very much interested in the article by Harry Hoisington, under the title given above, on page 1017, Vol. 68, of the *American Machinist*. However, I believe that the erasures should be made with a steel eraser. It is not only better and faster than any other method, but will not destroy the tracing, when properly done. The fact that the majority of draftsmen who try to use a steel eraser have not been taught the correct method, should not condemn the practice. In order to obtain the proper results when using a steel eraser on tracing cloth, there are certain vital points that must be borne in mind.

It is very essential that the tracing cloth should lie on a hard, smooth surface. A piece of glass cannot be equaled for this purpose. Old photographic plates are excellent. A celluloid triangle may be used as a makeshift, but more care must be taken on account of the shape of the triangle. The right kind of an edge on the eraser is the key to the whole thing. The ink must be removed without destroying the coating on the cloth. This requires practice. After the ink has been scraped off, rub the surface with a soft eraser to clean it. Going over the cleaned surface with a steel burnisher or any hard, smooth object will aid greatly when retracing. I always dust the surface over with pounce, and wipe it off before applying the ink. I trust that these few suggestions may be of help to someone trying to do this kind of work.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Volume or Profits

VOLUME and profits have so long been linked as the terms of prosperity that many fail to see that they are frequently strangers instead of close relatives. Justification for the term "profitless prosperity" comes from a failure to recognize the fact that mere volume may be a liability rather than an asset.

Standardization and mass production have reduced manufacturing cost to an astonishingly low figure in many cases. Sales executives, however, do not always realize that, after a certain volume has been reached, further reductions in costs, due to volume alone, are likely to be extremely small. They seem to think that by increasing shop orders they can cut prices, sometimes more than the total labor cost of production.

Fortunately for industry, executives are beginning to appreciate that volume alone does not spell profits. They are learning that the cost of selling the increased production may far exceed the small amount saved by the increased volume. They are realizing the futility of doing a larger volume of business at a lower profit than was obtained before the strenuous efforts to secure the increase.

In many cases the problem of the seller boils down to one of setting a fair price and maintaining it; of foregoing the lure of greater volume at a price that renders a fair profit doubtful. The buyer, also, should see that unless a fair profit is maintained his sources of supply cannot be depended upon to continue improving the products that are a necessity in his industry. A good target to aim at is adequate volume, with a satisfactory profit.

The Customer Always Pays

SELLING costs are now being carefully considered by forward looking managers of industry. Such managers are beginning to realize that not all of the possible economies are confined to the production department.

One important item in the cost of selling as now practised is the time salesmen waste in waiting to see the men who either specify or buy the products they have to sell. This time runs up to an amazing total in many cases, especially where arbitrary rules as to hours and days exist. Some firms so limit hours at which salesmen may be seen that it is impossible for them to do a fair day's work. If, as in some cases, it is possible to see the buyer only between 10 or 10:30 a.m. and 3 or 4 p.m. the length of the salesman's day is pitifully short, especially when we consider the lunch hour of the buyer and the time necessary to go from one plant to another.

Add to the time lost by such arbitrary rulings the hours wasted in ante-rooms, waiting for a ten minute interview, and the net, effective hours per day are discouragingly few. Much of this lost time is avoidable. We all resent being interrupted, but it seldom matters very much whether we drop our work at the moment or after we have kept the caller waiting a half hour. We are too apt to consider that we are doing him a great favor in giving him the opportunity to acquaint us with machines that may save us many hundreds of dollars. Quite frequently the favor is the other way. And we are no more benefactors in buying than is the seller, if the purchase is mutually profitable, as it should be.

Aside from all questions of ethics or courtesy, there is one phase that should always be borne in mind. The cost of selling must be counted as part of the price of any article. Anything we do that increases the selling cost must be added to the price we, as buyers, pay for it.

A Precision Value for the Inch

IN ANOTHER column is an outline of a plan proposed by Luther D. Burlingame, a man well-known in connection with precision and standardization work, for a precise and standard inch that will be acceptable to manufacturers in Great Britain, the United States and in other countries in which the inch is used. This is not a merely theoretical argument but is a real problem that confronts makers of highly accurate work gages and other precision work.

The recommendations are made after careful study, with a view to making it easy to know the exact dimension meant in machine work of all kinds. We believe that manufacturers will do well to carefully consider the proposal made. It seems a bit absurd for countries using the inch as a standard to depend on conversion from other units. It is high time that we had physical standards for the inch, the foot and the yard.

· SHOP · EQUIPMENT · NEWS ·

Brown & Sharpe Nos. 1A Universal and 1B Plain "Standard" Milling Machines

SLIGHTLY smaller capacity than is found in previous sizes is offered in these machines, which have been introduced by the Brown & Sharpe Manufacturing Company, Providence, R. I. The Nos. 2A and 3A universal and 2B and 3B plain were described on page 35, Vol. 68, of the *American Machinist*. Nos. 1A and 1B are shown in Figs. 1 and 2, respectively. Neither style is equipped with power fast travel, dual control for changes of the feed, nor pump, although either can be furnished with power fast travel and the pump. These machines are of the motor-in-the-base type, having double over-arm construction. They are provided with an automatic longitudinal and transverse table feed. Vertical feed for the table is by hand.

Like other "Standard" type machines, the Nos. 1A and 1B are of the sliding-gear type. They are provided with a single lever for operating the feed changes, located at the foot of the machine. These changes, in two series, are also obtained with the operation of a single lever in the side of the column. Direct-reading dials indicate the feed or speed for which the machine of either type is set. The feed and speed units are driven throughout with heat-treated alloy steel gears which provide a smooth transmission. The spindle is mounted on three roller bearings, two at the front and one at the rear, with means for adjustment.

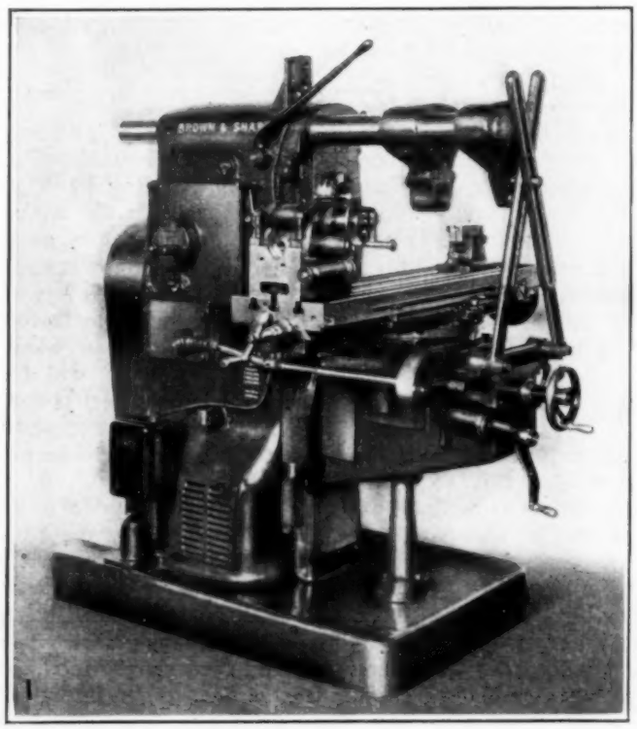
The knee may be clamped from either the front or rear of the table by means of a single lever. It is provided with a one-piece knee screw which is completely guarded in all positions, and does not extend below the floor. The driving clutch is of the multiple-disk dry type, and is located outside of the column. It is operated by a single lever on the side of the machine.

Automatic lubrication throughout is another feature. A pump in the column delivers oil to all mechanisms within the column and to the driving pulley. The oil is filtered on each passage through the machine. The knee mechanism is also provided with a pump which furnishes automatic lubrication for the knee assembly. These machines are equipped for belt or motor drive, or with motor, depending upon the requirements of the customer.

"U. S." 9-Inch Disk Sander

Sturdy construction and correct balance are features of this 9-in. disk sander which has been placed on the market by the United States Electrical Tool Company, Cincinnati, Ohio. The unit is driven by a fan-cooled universal motor running at 3,600 r.p.m. Ball bearings are used throughout.

According to the manufacturer, the machine handles easily, making for maximum ease and speed in operating. A two-pole trigger switch in the handle is used for starting and



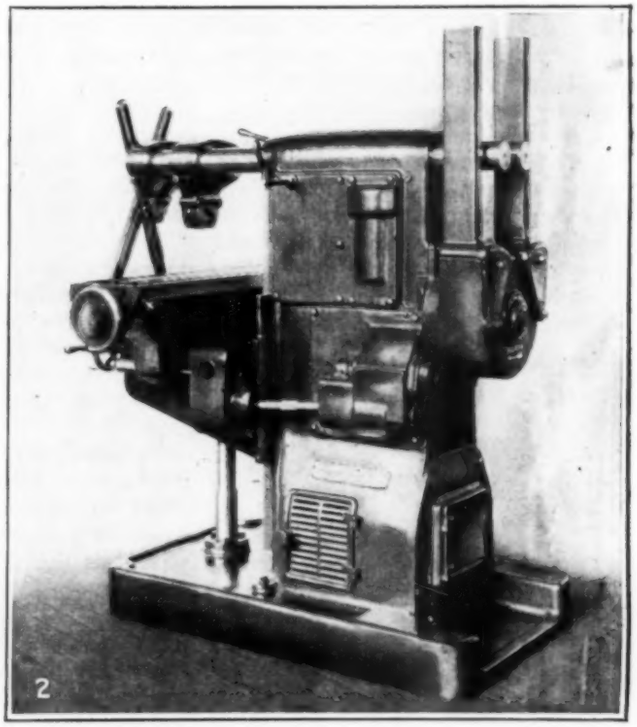


Fig. 1 — Front view of the Brown & Sharpe No. 1A "Standard" Universal Milling Machine equipped with motor drive. Fig. 2—Rear view of the No. 1B "Standard" Plain Milling Machine equipped for belt drive

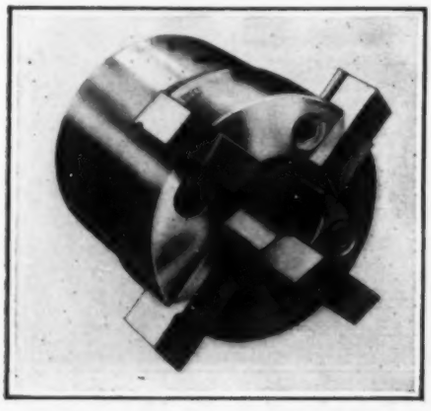
"U. S." 9-Inch Disk Sander

stopping. Fine, medium, and coarse sanding disks are furnished, together with 12 ft. of flexible rubber-covered cable, a two-piece attachment plug, and an armored guard. The weight is 12 pounds.

McCrosky 4-Point Boring Head

By the adaptation to this boring bar of a locking device used in the "McCrosky-Super" adjustable reamers, four high-speed steel blades are rigidly locked in the hardened body. The boring head has been developed by the McCrosky Tool Corporation, Meadville, Pa. As shown in the illustration, a groove is provided in each blade to receive a drill rod pin which is also embedded in a groove in the body. A hollow setscrew bears against the pin and forces it tightly into the groove of the blade. This method of locking the blade permits heavy cuts, it is claimed.

Boring bars having a diameter of 3 in. have a radial adjustment of $\frac{1}{4}$ in., while 6-in.bars have an adjustment of $\frac{1}{2}$ in. The adjustments for other sizes are in proportion. The head can be made in sizes from $2\frac{1}{2}$ in. up. This tool is made specially to order to meet the specifications for definite boring jobs. The head can be used with a shell reamer mounted on a bar for roughing and finishing in one operation. The large hole in the body of the head permits the use of a sturdy bar.



McCrosky 4-Point Boring Head

"Filor" High Precision Thread Grinding Machine

PRODUCTION grinding of accurate thread gages, taps, hardened worms, and micrometer screws, is the field of this "Filor" machine which has been introduced into the United States by the R. Y. Ferner Company, Investment Building, Washington, D. C. The thread grinder is built by the Societe Genevoise d'Instruments de Physique, Geneva, Switzerland. It is intended for use when accurate pitch, diameter, and profile of thread is required.

The machine is sturdily built, and it is claimed to produce a fine finish, with the consequent elimination of the need of lapping. It is fully automatic in operation. The feed of the grinding wheel can be stopped at any desired point so that, according to the manufacturer, a series of pieces of the same size within a few ten thousandths of an inch can be produced.

The maximum distance between centers is 12 in., and the maximum length of thread that can be ground is $4\frac{3}{4}$ in. By an axial adjustment of the nut of the master screw, it is possible to have useful grinding travel on any section in the range of the maximum center distance. The maximum diameter which can be ground with a new wheel is $3\frac{1}{8}$ in., while with a worn-out wheel it is possible to grind pieces as large as 5 in. in diameter.

To increase the production of the machine, it has been designed to grind on the return motion as well as on the forward travel. To accomplish this the table is controlled by interchangeable master screws, rigidly fixed at the extremity of the main spindle. The latter is driven alternately by an oscillating shaft having universal joints. A counterweight pulls the work table constantly towards the left. This force is transmitted to the master screw and eliminates any play in its nut. By this means the workpiece is held rigid with the master screw, and so executes a helical motion corresponding to that of the master screw without any relative displacement when reversing. The grinding wheel, which is fixed in the axial direction, therefore, cuts a true helix. The main spindle is lubricated by an automatic oil circulation system provided in the headstock.

The nut of the master screw is carried by a heavy sleeve which is provided with a fine adjustment to bring the grinding wheel into accurate contact with the threads of the roughed-out workpiece. The adjustment equals 0.01 inch per rev. of the handwheel. Next, when the setting has been made, the sleeve is strongly clamped in its support. The master screws can be changed easily and quickly.

Little Excess Travel Required

To minimize wear, a grinding wheel $17\frac{1}{4}$ in. in diam. is used. The slide carrying the grinding wheel is constantly pulled towards the workpiece by a counterweight suspended on a belt, and thrusts only against the nut of the feed screw. At one of the dead points of the table travel, the feed screw of the grinding whee! is operated by an automatic pawl device. The feed of the wheel is carried out quickly so it is not necessary to give the table a considerable excess of travel.

Control of the pawl device is by hand, and can be effected without interrupting the automatic feed. It can be adjusted to any feed between 0.002 and 0.0002 in., the feed being read on a graduated dial. The amount of the feed can be modified during the work without interrupting the grinding. The grinding wheel can also be adjustd quickly by means of a large handwheel, the rim

of which is graduated to 0.0005 inch.

The grinding wheel spindle is carried by two strong bronze bearings 2 in. in diameter. These bearings are lubricated by an automatic oil circulation system. The bearings of the grinding wheel are carried by a tilting table which can be readily set at the mean lead angle of the thread to be ground. The angle of tilt of the table can be read on a graduated arc by means of a vernier to within one minute.

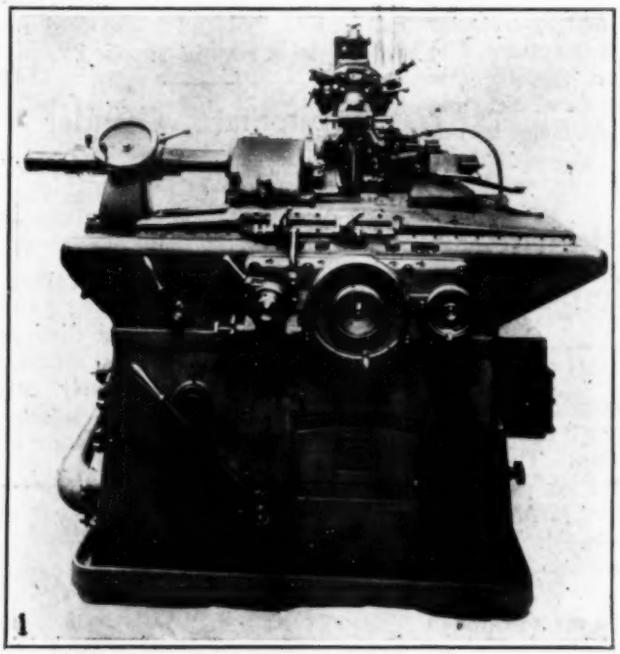
Speeds of 92 to 99 ft. per sec. are used for the grinding wheel. By means of a planetary gearing system located in one of the idler pulleys, the grinding wheel can be turned at at reduced speed of 88 r.p.m. for the rough dressing of the wheel, though the last cuts with the diamond are taken at the working speed of 1,360 r.p.m. Two driving belts are used to equalize the pull on the two bearings. A protecting cover completely incloses the grinding wheel and its two belts.

The annular grinding wheel is clamped between a forged steel adapter and a loose collar assembled by screws, and provided with a simple means for balancing the wheel. A dovetailed flange prevents pieces of the wheel flying apart in case the wheel should be split. The wheel is trued by a single diamond, arranged to successively dress both flanks, and to generate the rounding of the profile required for various threads. The radius of the rounding is measured by a micrometer screw with reading drum. The diamond holder is set at an angle of 15 deg. with the surface of the grinding wheel so that the diamond may be revolved in its support to present new cutting edges. All pivots of this device are grease packed and dustproof.

To insure stability when dressing, the crank carrying the diamond is supplied with a clamping device. The positions of the diamond holder crank corresponding to the two flanks of the grinding wheel are determined by adjustable stops, and the angle of the wheel can be read to 2 minutes of arc on a large drum completely protected by a metal cover, and having a glass window. The feed on the diamond during dressing can also be read.

A micrometer stop concentric with the feed screw of the grinding wheel limits its feed travel, so that the same diameter for all workpieces of a series is obtained automatically. Because of this feature, a single operator can control several Filor machines and obtain without difficulty, it is claimed, diameters within 0.00012 to 0.00016 in. from standard. The micrometer stop can be adjusted by means of a handwheel graduated to 0.00005 in. which can be clamped after the setting is made. Reversal of the work spindle is accomplished by a double friction clutch operated by oil pressure. The oil is supplied by a gear pump located in the speed gearbox at the rear of the machine, and is distributed by a special piston valve to either the one or the other of the two clutches. The distributor is controlled automatically by means of the sliding trip dogs of the table or simultaneously by a trip lever. This system of reversing has the advantage that by interchanging the connecting point of a link controlling the distributor, the grinding can be changed from right- to left-hand threads.

A change-speed gearbox, located at the rear of the machine, controls the main spindle through an oscillating shaft. The shifting pinion of the gearbox provides 4 rotative speeds of the spindle from 9 to 46 r.p.m. which are suitable for roughing of threads between ¼ and 3 in. diameter. Where a high polish is desired, the main spindle can be operated at the lower finishing speeds ranging from 2.6 to 12.8 r.p.m. by means of a reduced speed pulley driving the gearbox. It is claimed that a combination of these two ranges of speed permits the workpiece to be brought very close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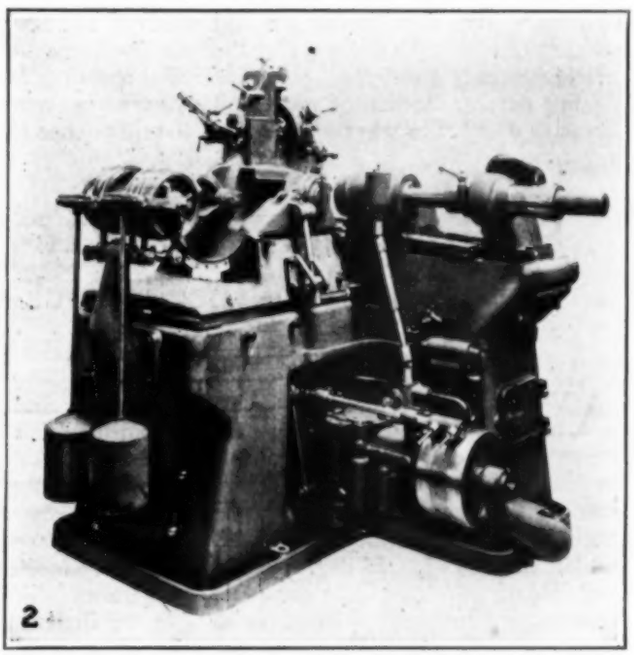
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Fig. 1—Front view of the "Filor" High Precision Thread Grinding Machine. Fig. 2—Rear view of the thread grinder

to the final size, and then only one or two passes at reduced speed need be made to obtain a good polish. The roughing and finishing speeds, as well as the stopping of the machine can be controlled by a single lever at the front of the machine.

A centrifugal pump is mounted on the machine to supply coolant to the workpiece and clean the grinding wheel. The water tank, bolted to the right side of the bed, holds about 5½ gal., and is provided with settling pots for the deposit of chips and mud. A large inspection window permits easy cleaning of the tank. Inspection doors are also provided in the bed of the machine. All the ways of the machine are carefully protected against the introduction of water and abrasive dust. The ways of the table are automatically oiled by rollers submerged in oil pockets.

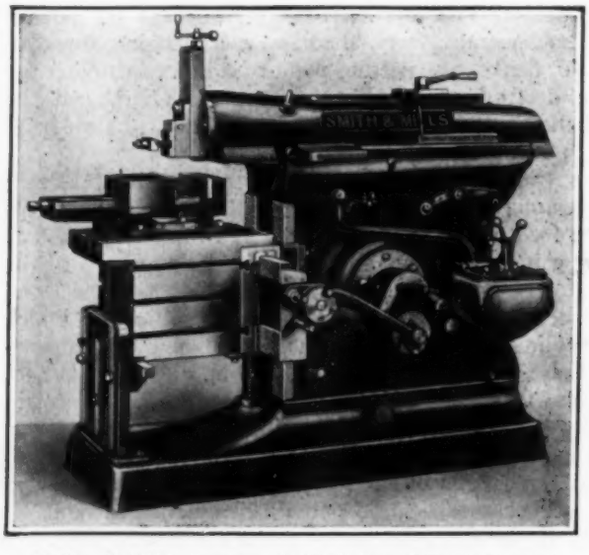
A swiveling microscope mounted on the tailstock, and provided with an electric illuminating device, serves for examination of the profile of the thread. As shown, all the controlling devices are arranged at the front of the machine and are placed within easy reach of the operator. The drive is through an over-head countershaft to the speed gearbox for moving the table, and also the grinding wheel and the cooling pump.

The dimensions are 5 ft. 11 in. by 5 ft. 6 in. by 4 ft. 11 in. high and the net weight is 5,320 lb. Master screws in regular pitches from 4 to 25 threads per inch are available. Six master screws are furnished and metric pitches may be obtained.

Smith & Mills Improved 16-, 20-, and 25-Inch High-Speed, Back-Geared Crank Shapers

A V-TYPE ram and a support holding the table rigid at extreme elevation are the principal improvements on the 16,- 20- and 25-in. crank shapers manufactured by the Smith & Mills Company, Cincinnati, Ohio. The ram has 55 deg. V-ways, and is of cap and gib one-piece construction for the full length, with a single horizontal adjustment for wear. The ram carrier has been lengthened and screw adjustment provided so that the ram can be positioned while in motion. The 25-in. shaper was described on page 410, Vol. 67 of the *American Machinist*. Ram ways are provided with felt inserts connected to an oiling arrangement.

Long shafts may be passed through the large opening in the center of the machine for keyseating. The massive construction of the head is provided to resist the tool thrust from heavy cuts. The head swivels through an arc of 90 deg. A chromium steel screw is provided with bronze adjusting nut taking up wear. The toolslide is fitted with a full length gib adjusted for wear by means of set screws with lock nuts. Readings to 0.001 in. can be made on the micrometer dial. Automatic vertical and horizontal table feed in either direction is provided. Feed is obtained by means of internal ratchet with drop-forged pawl and trip. It is positive in action. All feed gears are of steel, and a solid feed rod is provided. This rod has a feed disk containing 15 notches. Each notch corresponds to 0.010 in. feed.

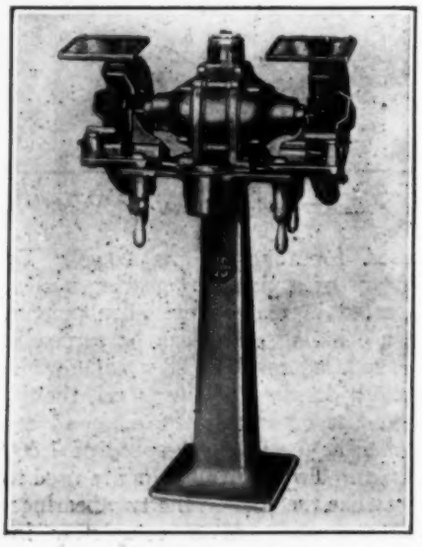


Smith & Mills Improved High-Speed Back-Geared Shaper

The gearbox is driven through a disk clutch by a single pulley mounted on tapered roller bearings. Motor drive may be furnished if desired. The twin-disk clutch and self-acting brake are controlled by a long lever on the operator's side of the machine. Starting and stopping of the ram is independent of the motor or pulley. Attachments such as automatic vertical feed to tool and worm feed revolving table may be supplied.

"AutoStart" Grinder

Both pedestal and base types of "AutoStart" grinders have been introduced by the U. S. Electrical Manufacturing Company, Los Angeles, Calif. Features include transparent eye guards, sliding and adjustable tool rests, and the elimination of compensators or hand starters. The windings are completely embedded and insulated with "Asbestosite" which prevents carbonization of the insulation. This material prevents entry of any dust, grit, or other substances into the windings. The chip shields are of glass, reinforced with heavy wire, giving clear visibility of the grinding operation. A simple adjustment gives the proper guard clearance regardless of the diameter of the wheels. As the



"AutoStart" Grinder

wheels are worn down, they can be slid back, as they are mounted on sliding tapers.

The toolrests slide with the wheel-guards so that the same amount of clearance can be had regardless of the diameter of the wheels. The wheels can be used to their minimum diameter with safety, according to the manufacturer. To remove and replace a wheel, it is unnecessary to use a pipe wrench, as the inner flange is keyed to the shaft, and can be held by a rod while the outside nut is loosened or tightened. The toolrests are equipped with locking levers.

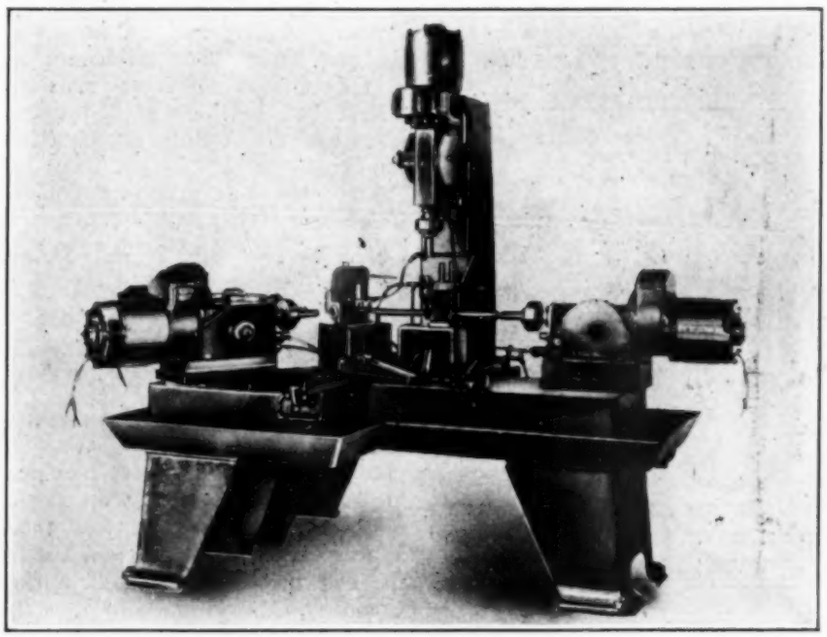
Millholland Special Automatic Drilling Machine

DRILLING and spot-facing of 4 holes of similar size in 7 malleable castings of different length is the work of this machine which has been announced by the Millholland Sales & Engineering Company, 1823 Ludlow Ave., Indianapolis, Ind. The holes are drilled by means of four automatic drill head units mounted on the base, and controlled by compressed air. The fixture is arranged so that it can be adjusted for holding the seven different sizes.

At one end of the parts, there are two holes intersecting at an angle of 45 deg., and some parts are left- and some right-hand. The parts vary in length as much as 6 in. The intersecting holes are drilled by two units mounted in saddles and dowelled and bolted to a swivel plate which carries the Y-shaped bushing block and the quick-acting work clamp. By swiveling the plate carrying the two saddles and bushing block, either right- or left-hand Y-ends can be machined.

To compensate for the different lengths encountered, the swivel plate carrying the two angularly mounted heads is placed upon a false table located on the center line by means of a large key sliding in a keyway cut in the bed. The false table is adjusted in and out by means of a hand-wheel and screw, and is located at the proper distance from the center line of the vertical spindle by means of a dowel pin and bolts.

Directly under the vertical spindle is a screw-type drill bushing which is also used for clamping the end of the work. This bushing has an Acme thread. A pinion pressed on the end of the bushing meshes with a hand-operated clamping gear having two heavy pins in the upper face for inserting a lever. The rotation of the gear rotates the bushing and clamps or unclamps the work as desired. The two air control valves for the face drills are placed one each at the operator's right and left hands so that he will not become confused in controlling the sequence. The automatic drill head units are entirely independent of each other and have separate driving motors. The feed of the cutting tools is accomplished by a plate cam, designed to feed the drills 0.015 in. and spot-face at 0.005 in. per rev. A motor-driven pump supplies ample coolant.



Millholland Special Automatic Drilling Machine

Scully Adjustable Boring and Turning Bars for Lathes

In addition to boring and turning, internal or external threading may be performed with these bars which have been introduced by the Scully Steel & Iron Company, 2364 South Ashland Ave., Chicago, Ill. They are made in several different sets ranging from small tools to large boring bars, to fit over tool posts or into cross-slides. Those tools are intended for use in holders which are built in five sizes, the first two being standard and illustrated in Fig. 1. The bars, illustrated in Fig. 2, range from $\frac{3}{4}$ to 3 in. in diameter, and from 14 to 30 in. in length. They are double-ended and take cutters $\frac{1}{4}$ to $\frac{5}{8}$ in. in thickness. The smaller tools are made in sizes from $\frac{1}{4}$ to $\frac{5}{8}$ in. in diam., and 6 to 8 in. in length. Collets and sleeves for each size are available.

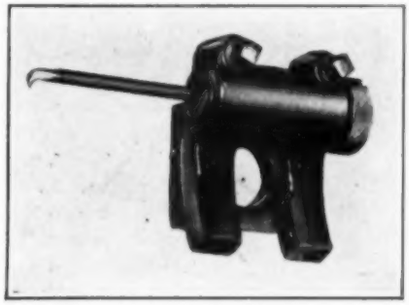


Fig. 1—Scully Boring Bar Holder equipped with collet and small boring tool

The two standard holders and a small boring tool set are quickly attached to a lathe by removing the toolpost rings and inserting the loose

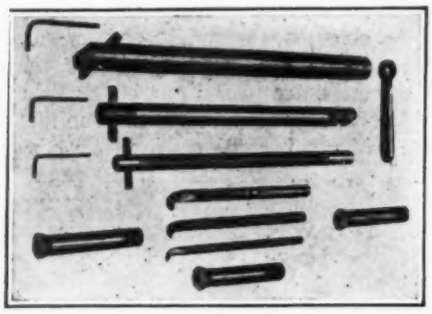


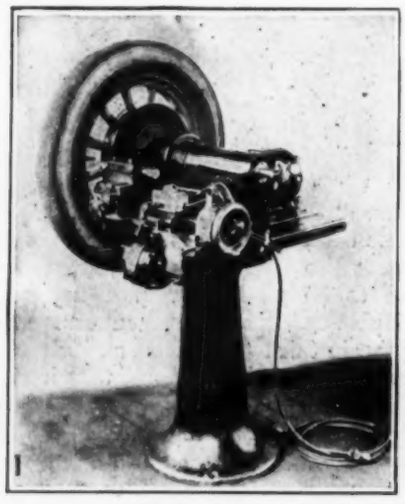
Fig. 2—Scully Adjustable Boring and Turning Bars and Small Boring Tools

tongue. The post screw is then tightened. The three heavy-duty holders are attached to lathes by removing the toolpost and slipping the baseplate into the cross-slide. The baseplate of the holder covers the entire cross-slide of the lathe, thus insuring a rigid bar. Lathes having extreme height can also be fitted with these holders since the baseplate has sufficient stock to be planed off. The body rotates on the baseplate and is held in place by special, hardened steel collar screws. No unnecessary overhang in the bars need be used, as the boring and turning can be done closer to the cross-slide by moving the bar farther into the holder. Hardened tool steel set screws hold the cutters in position. Both ends of the bars are hardened. Bushings are split for clamping smaller bars.

Reed-Prentice Brake Drum Turning and Honing Lathe

BRAKE drums can be turned on this lathe without removing the tire or rim. The machine has been introduced by the Reed-Prentice Corporation, Worcester, Mass. It is intended for automobile service stations. Fig. 1 shows the machine set up for turning the exterior of the drum on an automobile wheel, while Fig. 2 shows a truck wheel mounted on a shaft supported by an outboard stand. This attachment is furnished with a steel floor plate as shown. Passenger car or truck wheels are applied to the machine by means of a taper arbor fitting directly into the taper hole in the spindle which, in turn, is threaded for a drawbar. Timken bearings are used on the spindle.

This lathe is constructed with a pedestal base. The spindle drive is through worm and worm gear running in oil, power being supplied by a ½-hp. motor suitable for 50- or 60-cycle, single-phase, 110- or 220-volt a.c. or 115- or 230 volt d.c. circuits. The toolslide is connected through a worm and worm gear to a $\frac{1}{12}$-hp. motor of similar voltage and current. Both motors are connected with a tumbler switch which automatically controls the feed of the toolslide through an adjustable rod. The tumbler switch operates both the drive and feed motors. A honing tool may be supplied, which consists of a bar fitting into the tool block the same as the cutting tool, and which holds two honing stones to finish the outside and inside of the drum.



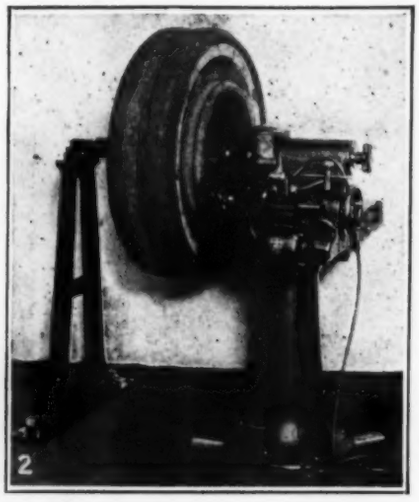
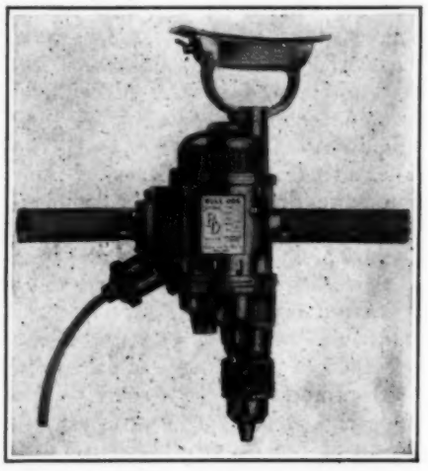


Fig. 1—Reed-Prentice Brake Drum Turning and Honing Lathe with passenger car wheel mounted thereon. Fig. 2—Outboard support applied to lathe when turning truck wheels

"Bull Dog" Electric Drills

Five sizes of these "Bull Dog" electric drills have been placed on the market by the National Electric Products Company, 140 Baxter St., New York, N. Y. Capacities are $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{1}{2}$ to $\frac{3}{4}$, and $\frac{7}{8}$ in. The ½-in. drill operates on 110-volt, 25- to 60-cycle, a.c. or 110-volt d.c. circuits. It has an all-aluminum body, rubber covered handles, and an improved plunger switch. The attachment plug is unbreakable. Spindle runs in S.K.F. ball bearings at 270 r.p.m. when loaded. A three-jaw chuck is standard.

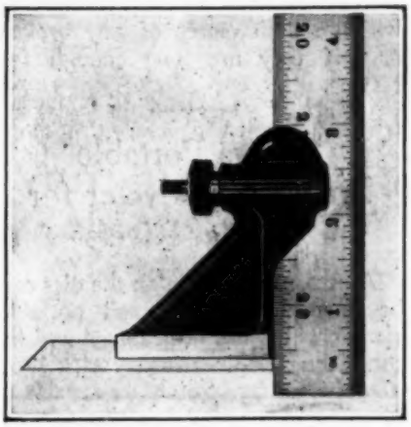


"Bull Dog" ½-Inch Electric Drill

The $\frac{1}{2}$ to $\frac{3}{4}$-in. size is a double-action drill giving speeds of 850 and 425 r.p.m. The $\frac{7}{8}$-in. drill weighs 22 pounds.

Brown & Sharpe Nos. 465 A and 465 B Height Gage Attachments

For making comparative measurements and finding heights or projections from plane surfaces, these attachments have been introduced by the Brown & Sharpe Manufacturing Company, Providence, R. I. The No. 465 A is for use with combination squares and sets having 9-in.



Brown & Sharpe Height Gage Attachment

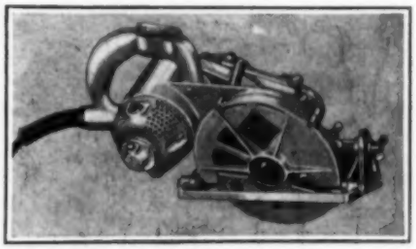
blades, and the No. 465 B is suitable for blades 12, 18, and 24 in. in length. Neither attachment can be used with sets having heavy blades.

In measuring a height from a plane surface, the measurement is easily read from the square by means of the pointer blade, which projects from the body of the attachment to the edge of the blade. The measurement is read directly. A feature of the attachment is its ability to be used in all positions from the extreme top to the bottom of the blade. It is also reversible and can be used on either side. The frame is drop forged, and has a smooth japanned finish. The pointer is made of steel, hardened, tempered, and ground.

Wappat "Little Alta" Electric Handsaw

Protection to the operator and saw blade is afforded by the lower guard, a patented feature, which completely incloses the saw blade, opens gradually by telescoping into the upper guard as the saw is pushed into the material, and immediately snaps shut as the cut is finished. This handsaw is manufactured in three models by the Wappat Gear Works, Inc., Pittsburgh, Pa. These models are intended for plain cutting, bevel cutting, and adjustable dado cutting, respectively. All models have the shoe adjusted vertically, thus making it possible to set the saw to cut any required depth up to 2 in. The handsaw will cut all kinds of wood, soft metals, Bakelite, fiber, and various similar materials.

Power is furnished to the saw by a high-speed universal motor, fan-cooled and mounted on ball bearings. A blast of air is directed at the front of the saw, thus clearing the sawdust away and making it possible to follow a straight line accurately. The saw shaft, mounted on tapered roller bearings, is driven by helical gears on a shaft mounted on ball bearings, all completely inclosed and running in grease. A double-pole non-arcing switch is mounted in the handle. The frame is of aluminum, highly polished, and all exposed steel parts are rust-proofed. A steel saw table, size 16x26x11 in. high can be furnished, to which the saw can be attached.



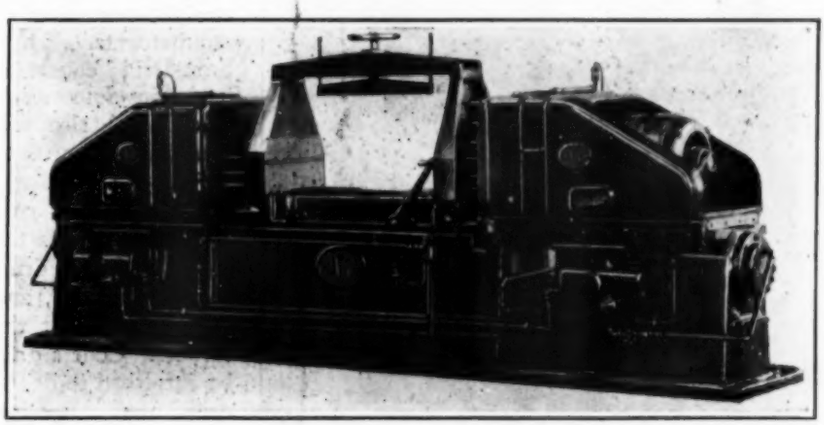
Wappat "Little Alta" Electric Handsaw

Many of the aluminum alloy parts of the saw are heat-treated.

Natco 6-Inch Sliding-Head Hydraulic Drilling Unit

ALL holes in both sides or both ends of cylinder blocks can be drilled in one operation on machines employing two of these units. These hydraulic sliding heads have been developed by the National Automatic Tool Company, Richmond, Indiana. They may be built into machines drilling cylinder blocks, body brackets, or other pieces requiring similar treatment. The capacity of the 6-in. "Natco" unit is five 1-in. holes in cast iron at 0.009 in. feed per rev. The maximum travel for the standard unit is 12 in. and the motor size required is 7½ hp. The maximum feeding pressure is 5,600 lb. Feeds vary from 0 to 15 in. per min. Rapid traverse is approximately 80 in. per min. The weight is 4,000 pounds.

As shown in the illustration, two "Natco" sliding heads are set up to drill 60 cylinder blocks per hour. The right-hand unit is equipped with 22 spindles, 16 having nose adjustment and 6 without. The left-hand head is arranged with 8 spindles having nose adjustment.

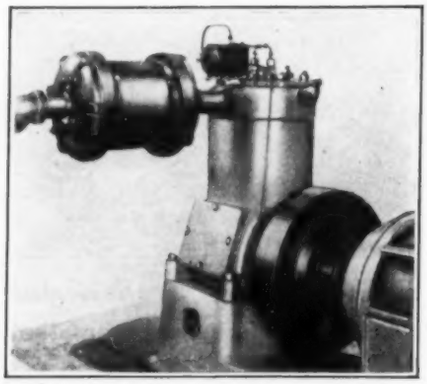


Cylinder block drilling machines consisting of two Natco Sliding-Head Hydraulic Units, and giving a production of 60 blocks per hour

Maxim Model D Discharge Silencer for Air Compressors

Noise originating in the discharge side of a small high-speed compressor may be eliminated by the use of this Model D silencer which has been introduced by the Maxim Silencer Company, Hartford, Conn. This noise is created by the rapidity with which the discharge valve of the compressor seats at the end of the compression stroke. It is then transmitted to the air receiver and there intensified.

The silencer is small, and easy to install. Connection is made by means



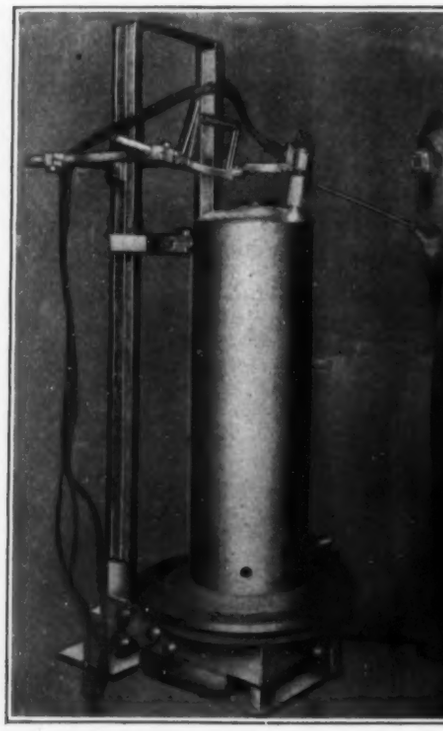
Maxim Model D Discharge Silencer for Air Compressors

of standard pipe threads, one at the center of the inlet head and one at the center of the outlet head. The casing is designed to withstand a pressure of 125 lb. per square inch.

Lincoln "Electronic Tornado" Tank Welder

Welding speeds of 100 to 150 ft. per hour may be obtained on this machine which is manufactured by the Lincoln Electric Company, Cleveland, Ohio. It will be noted that the framework of the machine is constructed entirely from welded steel. In making an edge weld as illustrated in the accompanying cut, no additional filler metal is used. The heat of the carbon arc fuses the edges of the cylinder shell with the flange of the dished head, thus making a leakproof joint. It is suitable for work such as range boilers and oil and gas tanks.

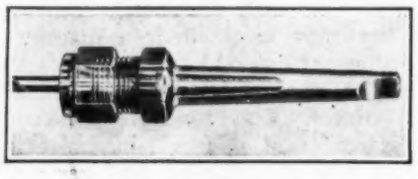
The holding fixture consists of a rotating table driven by a small variable-speed motor, and a vertical support carrying a fixed steadyrest and the welding head. The "Electronic Tornado" welding head is flexibly mounted so that the length of arc is at all times under the control of the operator.



Lincoln "Electronic Tornado" Tank Welder in use

"Save-Drill" Chuck

Both long and short straight shank drills can be held in this "Save-Drill" chuck which has been developed by the Sandusky Nut Company, Sandusky, Ohio. The device consists of three pieces, a hexagon locking nut, a one-piece collet and the body.



"Save-Drill" Chuck

The hexagon locking nut forces the collet into a locking bevel in the body which is ground to a perfect center. The body carries a hexagon which aids in removing drills. The shank may be taper or straight according to requirements. This Save-Drill chuck is made in four sizes. The No. 1 size will take drills from 0 to $\frac{5}{16}$ in., and the diameter across the corners is 1 in., while the No. 4 will take drills from 0 to $\frac{3}{4}$ in., and is $1\frac{3}{16}$ in. across the corners. Collets can be furnished to fit the drills used. Because of its compactness, this chuck may be used for drilling holes on close centers. It will use both pieces of any broken drill if they are long enough for service.

Hanna Portable Pneumatic Riveter for Tubular Rivets

A pressure of 1 ton on the dies can be exerted by this small portable riveter which has been introduced by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. The machine, which weighs 15 lb., has a 5-in. depth of throat, a 2-in. gap, and a 1-in. die stroke. It is capable of driving tubular bronze or steel rivets up to $\frac{5}{16}$ in. in diam. According to the manufacturer, it is particularly adapted to the riveting of automobile hoods, instrument panels, and bodies.

Hanna Portable Pneumatic Riveter for Tubular Rivets

General Electric No. 280 Slushing Compound

For slushing gears, shaft journals and exposed finished metal parts of machinery to prevent rust while in storage or in transit, this No. 280 viscous slushing compound has been placed on the market by the Merchandise Department of the General Electric Company, Bridgeport, Conn. According to the manufacturer this compound is cheaper than most greases and vaselines previously used for this purpose, and it has the added quality of partially drying on the metal, thus forming a protective coating which will not readily rub off in

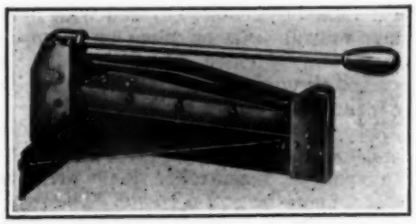
handling, but which is easily removed by benzol. It comes in various size containers ranging from barrels down to 1-gal. cans.

Potter & Johnson Models 6-DE and 6-DL Automatic Chucking and Turning Machines

Greater capacity than in the model 6-D is found in the models 6-DE and 6-DL automatic chucking and turning machines developed by the Potter & Johnson Machine Company, Pawtucket, R. I. These models are outgrowths of the 6-D which has been on the market for several years. The 6-DE has a swing of 29½ in., which is 5 in. more than on the 6-D. The 6-DL has a turret slide travel of 28 in. as against 18 in. for the 6-D. This extra travel is of value where it is necessary to pilot long boring cuts.

"Clipper" 10-Inch Belt Cutter

For cutting lengths from a roll or squaring ends of belting up to 10 in. in length, this cutter has been introduced by the Clipper Belt Lacer Company, Grand Rapids, Mich. It will square all makes of belts, and of the toughest material up to 10 in. in



"Clipper" 10-Inch Belt Cutter

width with slight pressure on the handle in one operation. The device is made from cold-rolled steel and malleable castings where necessary. Tool steel is used for the knife.

Whitney No. 7½ Punch

This No. 7½ punch has been added to the line manufactured by the Whitney Metal Tool Company, 97 Forbes St., Rockford, Ill. Its capacity is midway between that of the No. 7 and No. 8 punches. It will punch a ¼-in.

Whitney No. 7½ Punch

hole through plate $\frac{3}{16}$ in. thick. The gap is 4 in. in length and $\frac{3}{8}$ in. in height, and the overall length is 22 inches.

The operating handles will not become disengaged. They are drop forged. All wearing parts are hardened. The device will punch inside of 90 deg. It is furnished with three punches and dies. The weight is 10½ pounds.

Starrett High-Speed Hacksaw Blades

Although costing more than tungsten alloy blades, these high-speed hacksaw blades are claimed to reduce the cost of cutting. They have been introduced by the L. S. Starrett Company, Athol, Mass. The No. 840 blades are intended for hand use, and

Starrett High-Speed Hacksaw Blades

the No. 850 blades are suitable for power saws. The former come in 10 and 12 in. lengths, while the latter are available in 12, 14, and 17 in. lengths.

Trade Catalogs

CONTROL FOR STEEL MILL AUXILIARIES. The General Electric Co., Schenectady, N. Y., has published Bulletin 451A, showing the application of MT control for d.c. mill and crane motors. Many photographs are used to show different jobs which this control performs in the mill, and the operation of the control boards. Contactor assemblies, resistors and switches are illustrated and described.

SPOT WELDERS. The Federal Machine & Welder Co., Dana Ave., Warren, Ohio has published bulletins No. 250 and 260 on "Junior" Spot Welders and "Heavy-Duty" Spot Welders, respectively. The first shows various types of the "Junior" spot welder together with important parts. Several types of light spot welding which may be performed on these machines are illustrated. These machines are wound to operate on standard voltages. Bulletin No. 260 is devoted to the series 300, 400 and 500 heavy-duty spot welders in both standard and special types. In addition to the ratings of the various sizes being given, various important assemblies and replacement parts are shown. Types of heavy-duty production spot welding are depicted.

STOCK LIST. The Diehl Manufacturing Co., Electrical Div. of the Singer Manufacturing Co., Elizabethport, N. J., is publishing a stock list of motors and exhaust fans to appear on the 1st and 15th of every month. This stock list will be mailed on these dates to interested persons by the above company.

TIMING DRIVE. The Diamond Chain Manufacturing Co., Indianapolis, Ind., has published a pamphlet entitled "The Modern Timing Drive," which describes and illustrates timing drive chains for motor cars. Attention is directed to the light weight, compact design, long life, and minimum elongation.

TRADE-MARKING. The Noble & Westbrook Manufacturing Co., Hartford, Conn., has published a pamphlet entitled "Trade-Marking Your Goods," which emphasis the need for proper trade-marking of goods to receive successful consideration and the good will of the public. The service which the above company renders is indicated.

Pamphlets Received

ABSENCES FROM WORK. The U. S. Public Health Service has issued reprint No. 1142 from the Public Health Reports of 1927, entitled "A 10-Year Record of Absences from Work on Account of Sickness and Accidents." It represents the experience of employees of the Edison Electric Illuminating Co., of Boston, 1915 to 1924, inclusive. The reprint presents charts showing the frequency of absences, according to their duration in working days due to disability, among employees of a company that pays wages during illness compared with a company that does not do so. It also gives tables showing the annual number of days of disability for males and females for various illnesses. Other interesting charts are presented.

· SHOP · EQUIPMENT · NEWS ·

BIBLIOGRAPHY ON INDUSTRIAL SAFETY. The Library of the National Bureau of Casualty and Surety Underwriters, 1 Park Ave., New York, N. Y., has issued a book entitled, "A Review of General Literature on Industrial Accidents, Factory Management, Hours of Work, Fatigue and Rest Periods, Lighting, Heating, Ventilation, and Sanitation, and Literature on These Subjects With Relation to Safety in Production." This book was prepared by Mildred B. Pressman, and is Part 2 of a bibliography on industrial safety. Each item is briefly reviewed. The work is divided into three parts: Accident Prevention and Production; Accident and Production as Influenced by Factory Management, Hours of Work, Fatigue, Lighting, Heating, Ventilation, Sanitation, and Health Service; Index to Periodicals and Society Publications which appear in the bibliography.

BUSINESS ORGANIZATION. The Metropolitan Life Insurance Co., New York, N. Y., is distributing through its Policyholders' Service Bureau a booklet entitled "Functions of the Sales Manager" which is No. 11 of a series known as "Business Organization." The booklet is a compilation of opinions on the functions of the sales manager, and points out that there is no general agreement on the subject. From the material contributed by leading business organizations throughout the country, a basic classification of duties from a practical standpoint has been drawn up. The selection of salesmen, their training, methods of compensation, sales promotion, sales direction, research, advertising and service are described in detail, in their relations to the functions of the sales manager. The report is illustrated with sales organization charts and salesmen's forms and blanks.

DISTRIBUTION PROBLEMS. The "Proceedings" of the National Distribution Conference for General Discussion of Sales and Distribution Problems held in New York City, June 28 and 29, 1928, under the auspices of the Bolt, Nut and Rivet Manufacturers Association, Pittsburgh, Pa., has been published by its sponsors. The conference was called for the purpose of extending a plan of distribution which was worked out previously in conjunction with the distributors of bolts and nuts. For the main part the Proceedings consists of opinions expressed by the representatives of manufacturers and jobbers. The committees appointed are appended.

GETTING ACCIDENT FACTS. The Metropolitan Life Insurance Co., New York, N. Y., is issuing, through its Policyholders' Service Bureau, the second of a series of publications on industrial safety, entitled "Getting Facts About Accidents." This booklet, addressed primarily to the chief operating official, outlines current industrial practice in obtaining and using accident facts as a means of promoting plant safety. It presents convincing evidence of the value of accurate knowledge concerning how and where accidents occur. Accidents forms are provided that have been found helpful in recording the necessary facts and making them available for study. There is also given a description of methods by which this information may be put to maximum preventative use.

HISTORY OF BAUSCH & LOMB. Announcement is made of its seventy-fifth anniversary by the Bausch & Lomb Co., Rochester, N. Y. in the July-August issue of its house organ. From its inception, the company has been bound up with the progress of the optical business in America. At present its distributors are found in all parts of the world. Photographs of the members of the general staff and sales organizations are published so that customers may visualize the persons carrying on the business.

OUTDOOR RECREATION FOR EMPLOYEES. The Metropolitan Life Insurance Co. is issuing, through its Policyholders' Service Bureau, Report No. 76, entitled "Outdoor Recreation for Employees." Such phases of the subject as the employer's part, activities for older employees, games for foreign workers, the advantages of competitive sport, noon-hour games and the summer camp are treated. The activities of various companies along these lines are cited. As a supplement, the booklet gives standard sizes of fields for games and programs for annual outings.

ROTARY PISTON COMPRESSORS. The R. Planche & Cie, Villefranche s/Saone, Rhône, France, has published a treatise which compares the various methods of compressing air by means of rotating machines. A full discussion of the theory and design of the company's rotary piston compressors is presented. The principle used is based on the variation and the movement of a volume of gas contained between the walls of a piston which moves inside a cylinder on the one hand, and the walls of the cylinder on the other. The booklet is replete with curves and photographs illustrating the theory and constructional details of the compressors mentioned. It contains 39 10½x7-in. pages.

STRESSES IN CONNECTING ROD ENDS —The V.D.I.-Verlag G.M.B.H. has published a pamphlet by Dr.-Ing. Josef Mahar entitled "Uber die Spannungsverteilung in Stangenkopfen." It contains a detailed mathematical study of the stresses in connecting rod ends. Data on research, tests performed, and methods of calculation are given. Included are 57 tables and curves. The booklet can be obtained from the above society at Berlin, Germany, for 3.40 marks.

TESTING CORROSION RESISTANCE. The Dept. of Commerce, Bureau of Standards, has issued Bulletin No. 367, entitled "The Effect of the Testing Methods on the Determination of Corrosion Resistance." Tests were carried out on five metals, which were copper, nickel, and three copper-nickel alloys, all of commercial grades. The results indicated that the essential features of the service to be met should be incorporated in any corrosion tests designed to give information concerning the suitability of a metal for some particular type of service. Copies may be obtained for 20 cents.

THE EMPLOYMENT INTERVIEW. The Metropolitan Life Insurance Co., New York, N. Y., is distributing through its Policyholders' Service Bureau "The Employment Interview" which is No. 2 of a series known as "Handy Manuals of Employment Practice." According to the manual, the purpose of the interview is to fit the right man to the right job. The ways and means used by representative companies in conducting such interviews are outlined in this booklet. The mechanical record forms of half a dozen companies add to the interest of the leaflet.

WEAR RESISTANCE OF DIES. W. J. Merten, metallurgical engineer, The Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. has reprinted an article entitled "Wear Resistance of Cutting Edges of Blanking Dies and Shear Blades," presented before the winter sectional meeting at Washington of the American Society for Steel Treating. The paper discusses the effect of shearing and blanking of sheets and plates upon the cutting edges of shear blades and die parts when these sheets and plates are covered with hammer or roll scale or when an intensely hard and abrasive constituent is dispersed through them. It gives a review of the various methods employed to hinder fragmentation of the hard crystals and to imbed them when fractured so as to avoid and neutralize their grinding effect upon the cutting edge. The paper is obtainable from the author for 35 cents.

WELDED PIPING. The Linde Air Products Co., 30 East 42nd St., N. Y., has published a pamphlet entitled "Oxwelded Industrial Piping." Economy in the cost of materials and fabrication results from the employment of welding of industrial piping systems. The statement is made that the initial cost of a welded line is 30 per cent cheaper than that of a screwed one. The maintenance cost is reduced by approximately 80 per cent. The erection in the field is much simplified since elaborate scaffolding is not required, and the weight is much less because of the absence of screwed fittings. Many photographs are used to depict welded lines in service, and the methods of fabrication.

NEWS OF THE WEEK

Lower Air Mail Rates Increase Volume

The recent reduction in the postage rate on air mail has caused a very considerable rise in volume of mail to be carried. Companies operating passenger planes have been called upon to increase their facilities for handling the passenger traffic crowded off the airways by the deluge of mail flown since the reduction. W. C. Herron, vice-president in charge of traffic for the Boeing Air Transport Co., believes that the growth will continue and that virtually all mail will be sent by air in the future. Planes now carry 15 per cent of the total.

W. Irving Glover, second assistant postmaster general, has returned to Washington after a six months' inspection trip of the air mail lines in the west and northwest. He prophesies that within three years passenger travel by air in this country will equal the European mileage distance, and that the greatly increased volume of mail will give rise to new planes of much greater carrying capacity for the air mail service.

Steel Treaters Announce Technical Sessions Program

Ten technical sessions of the American Society for Steel Treating will be held in Philadelphia during the week of October 8, in connection with the annual convention of the society. Morning technical sessions will be held in the ballroom of the Benjamin Franklin Hotel, and the afternoon sessions will be in the assembly hall at the Commercial Museum, where the National Metal Exposition will be under way. The following list of chairmen has been announced for the various morning and afternoon technical sessions: R. M. Bird, district sales manager, Midvale Co.; Albert E. White, director, Department of Engineering Research, University of Michigan; J. A. Mathews, vice-president and director of research development, Crucible Steel Co. of America; T. D. Lynch, consulting metallurgical engineer, Westinghouse Electric & Manufacturing Co.; Dr. Albert Sauveur, Gordon McKay professor of metallography and metallurgy, Harvard University; J. Fletcher Harper, research engineer, Allis-Chalmers Manufacturing Co.; Bradley Stoughton, professor of metallurgy, Lehigh University; and W. Trinks, professor of mechanical engineering, Carnegie Institute of Technology. The chairman of the annual meeting of the American Society for Steel Treating will be Fred G. Hughes, vice-president and director of the New Departure Manufacturing Co. The chairman of the Campbell Memorial Lecture will be Dr. George K. Burgess, director of the Bureau of Standards, and the chairman of the joint meeting of the Institute of Metals and the A.S.S.T. will be Dr. Zay Jeffries, consulting metallurgist, Aluminum Company of America.

Motors Export Trade Shows Increase

The export business of the General Motors Corporation has become one of its major operations. Taking the results of the first six months as a criterion, it is very likely that the over-seas business this year will be close to 300,000 vehicles, representing a sales volume of $250,000,000 at wholesale prices. This would place the corporation near the head of the list of American exporters, with the volume of its foreign business exceeded only by the exports of cotton and petroleum products.

General Motors sales abroad for the first six months of 1928 totalled 137,470 cars and trucks, a gain of 48.7 per cent over the corresponding period for 1927. Total sales, domestic and foreign, increased 22.6 per cent in the same period.

New England Industries to Meet in Fall

The New England Industries Meeting will open in Boston on Oct. 1 with a council meeting which will be followed by a luncheon of the council with various committees. In the afternoon simultaneous sessions will be held on education and training for the industries and materials handling. The authors of papers at the first session are C. K. Tripp, supervisor of apprentices at the General Electric Co., Lyon, Mass., and Walter S. Berry, director of training of the Scoville Manufacturing Co., Waterbury, Conn. At the materials handling session D. W. Coe, vice-president and general sales manager of the Canadian Mead-Morrison Co., Ltd., Montreal, Canada, will deliver a paper, and also C. G. Spencer, of Baker & Spencer, Inc., New York City.

At Tuesday morning's session on aeronautics the speakers scheduled to present papers are Sumner Sewall, traffic manager of the Colonial Air Lines; A. Willgoos, chief engineer of the Pratt & Whitney Aircraft Corporation, and F. W. Mesinger, associated with the Norman-Hoffman Bearing Corporation, Stamford, Conn.

The Applied Mechanics Session will include papers by A. Dinnick, professor of mechanics at the Institute of Mines, Dniepropetrovsk, of Soviet Russia, and J. P. DenHartog of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Railroad papers will be given by R. J. Cullen, signal engineer, and H. S. Walton, supervisor of air brakes, both with the Boston & Albany Railroad.

The machine-shop session will feature a symposium of papers on machine-shop work for textile mills as well as a separate paper on internal grinding by Alden M. Drake, chief engineer of the Greenfield Tap & Die Corporation, Greenfield, Mass.

Gray Iron Institute Opens Cleveland Office

Permanent headquarters of the Gray Iron Institute have been established in the Terminal Tower Building, Public Square, Cleveland, according to an announcement by Arthur J. Tuscany, Manager of the Institute. The Gray Iron Institute, it is stated, has been incorporated to promote the interests of the gray iron foundry industry. There will be included among the activities of the organization, the collection and distribution of information on the manufacture of gray iron castings, the promotion of sound business ethics, merchandising, development of new markets, promotion of uniformity in cost accounting, research to improve quality, establishment and maintenance of standards and stimulation by co-operative effort, the use and sale of gray iron castings.

The officers of the institute are as follows: Walter L. Seelbach, Forest City-Walworth Run Foundries Co., Cleveland, President; B. H. Johnson, Cresson-Morris Co., Philadelphia, First Vice-President; A. E. Hageboeck, Frank Foundries Corp., Moline, Second Vice-President; H. S. Chafee, Builders Iron Foundry, Providence, Treasurer; Arthur J. Tuscany, Terminal Tower Building, Cleveland, Manager.

July Automobile Production

July production of motor vehicles in the United States, as reported to the Department of Commerce, was 390,445, of which 337,933 were passenger cars and 52,512 were trucks. This is a very substantial increase over the 268,485 motor vehicles produced in July of last year. The figures are based on returns from 156 manufacturers in the United States.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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"IF WE could only have easy money," a banker said the other day, "business this autumn would reach boom proportions."

This belief is becoming so common, and is so well supported by the fact of an unusually active summer in industry and a satisfactory farm outlook, that the stock market seems disposed to ignore the "if" and act as if the statement were unqualified. Signs of a speculative revival are not wanting. Activity is increasing and 3,000,000 share days on the New York Stock Exchange have again become common. The slight recovery in prices that began in July has been greatly accelerated and in the past ten days or so most of the principal issues traded in have gained on the average about 10 points. During most of that period, except for a day or two of obviously temporary easiness, call money has averaged about 7 per cent and time money has been quoted at 6½. Thus money cannot be termed easy, but there are indications of an incipient boom.

This is a condition which every thoughful business man may well analyze. If the buying is only foolhardy speculation of the kind that was seen earlier this year it may be ignored. But the great speculative markets, which reflect the knowledge and opinions of the world's best-informed business men as well as such inanimate influences as the supply of credit, are sometimes clairvoyant, and perhaps stocks are foreshadowing easier money even before the Federal Reserve authorities have made up their mind to give it to use. If so, the market is giving the "all clear" signal to business and it ought to be heeded.

Not until the Federal Reserve policy is more definitely developed will it be possible to say with certainty whether the speculative revival is really clairvoyant, or merely superficial and evanescent. If that policy shall be merely to maintain present rates, as most conservative bankers think, the stock market can expect to make little progress and as the momentum of present activity dies down business must prepare to take in its sails. If the policy shall be to advance rates by refusing additional credit to meet the seasonal expansion, further severe liquidation in stocks must be anticipated. Only of the policy shall be to supply easier money can the future of both stock market and business be viewed entirely without apprehension.

Of the business record that is now being written from day to day it need only be said that it is highly cheerful. The steel industry is operating at 85 per cent of capacity at Pittsburgh and 75 per cent at Chicago, and specifications received against contracts suggest no early falling off though new orders are few. The automobile manufacturers turned out nearly 400,000 cars in July, breaking the previous record for the month made in 1926, and most of them sold more cars than they made and continue to operate at the highest midsummer level in their history. Among the important industries it is only in cotton textiles that real depression is found; but the price of cotton goods is no obstacle to their ultimate consumption; last year's overproduction is being corrected by drastic curtailment, and since the country's purchasing power is so high business should improve greatly as soon as the size of the cotton crop is determined and buyers decide prices are safe.

WHAT'S DOING IN INDUSTRY

REPORTS from all over the country back up the statements of large machine-tool dealers in New York that sales for the first eight months of the present year are larger than any similar period since 1921, and that prospects for the fall season are much better than in August of last year. With the exception of the railroads, machinery buying is general, and the types and distribution of machine-tool sales made by some large companies indicate no special spurts in any industry or locality.

AUTOMOTIVE prospects in the Detroit district are exceptionally favorable. Ford is building up production rapidly, and the Hupp Motor Co. is constructing a new factory. An important truck manufacturer has put out advance inquiries on machine tool equipment, and there is a feeling that some large purchases are to be expected by the automotive plants. Practically every industry except the New England textiles reports good business prospects and interest in purchasing new equipment. Prospects are a little more favorable for heavy machine tools.

EMPLOYMENT in the Middle West has improved, and is now at a high level in the Detroit district. In New England it is reported as normal, with no surplus of skilled labor whatsoever. In the Milwaukee district buying of new equipment is reported as quiet, but there are prospects for good fall business. Steel mills in Pennsylvania are making some purchases. It only remains for the railroads to enter the market to complete an otherwise very favorable situation.

Each of the commodity markets is a law unto itself, for no common price trend is discernible. Cotton is upheld by increasing reports of weevil damage and plant deterioration which have dissipated some of the excessively large crop ideas of two weeks ago, but the bears are still confident that the crop movement will force lower prices. Wheat has revisited the season's lows, but it also is subject to the alarm of frost in Canada and on the whole the grains attract by their cheapness. In wheat a resemblance to 1923, when the low was made in August and the price advanced throughout the export season, is remarked. Sugar has run into a dull spot between buying movements during which the bearish opinion based on the expectation of record crops next season has its way, but considering supply and demand for the remainder of this season it is cheap.

The promise of a satisfactory farm income and the highest purchasing power of the past seven or eight years is not impaired. Active distributive trade based on this purchasing power is reported by the trade reviews. Work is obtainable for all who want it and for the immediate future there is little reason to expect much recession in activity.

With the acceptance speeches of both presidential candidates before the public, the campaign is now open in earnest. That it will be hotly contested is certain, but there is nothing in the issues involved or in the character of either candidate to give business any reason for worry.

Abroad the business seas have been calmed by monetary stability and the political seas by the signing of the Kellogg treaty renouncing war, to which forty-five other nations in addition to the original fifteen will be invited to subscribe. Some of the foreign exchanges are near the gold shipment point, which is another argument for easier money here, but the Reserve authorities have many other factors to consider in determining their policy.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

The current week displayed less activity among buyers in the New England machinery and machine tool market. Inquiries give the situation a promising tone, however, and the condition is expected to be only temporary. It appears likely that the last half of August will not equal the first half in comparative sales. The month, however, is sure to show improvement in all respects over August of 1927, but from information available, is hardly likely to equal July figures. Optimism prevails among dealers and builders, and a satisfactory fall business is anticipated generally.

This territory is particularly free from retarding industries with the exception of the textile industry. The labor situation, a very true barometer, industrially speaking, is normal. There is no surplus of skilled workers, and some machine builders have reported difficulty in securing these skilled tradesmen. Wages are inclined to be higher, due no doubt to this partial labor difficulty.

The Pratt & Whitney Aircraft Company is a fine illustration of what may be expected in an aeronautical way. According to recent figures, this company is producing 70 400-hp. Wasp engines and 30 500-hp. Hornet engines monthly as compared with 20 engines monthly in 1927. All these factors point to a continuation of the business momentum which has been so well maintained in the machinery industry. The automotive field gives promise of renewed buying in this section during the balance of the year.

NEW YORK

Business in the New York district is still affected by the vacation season, but there has been an improvement in the past week. With the exception of the railroads, buying has been fairly general though not heavy, and August sales have been in general below those of July. The railroads of the East have not been active in buying machine tools, and the only inquiry reported during the week was from the New York Central for lathes. Public utilities are reported as not buying anything in the line of power units, but this does not seem to have affected purchasing of machine equipment on the part of the electrical machinery builders. The General Electric Co. placed orders during the week for a number of varied machines, which incidentally were in nearly all cases purchased directly from the makers.

Inquiries are general, without tendencies towards any particular types of machines. The buying has included standard lathes, planers, drills, and such toolroom equipment as jig borers and die sinkers. Transmission equipment is reported as moving well. A maker of heavy machine tools, who had been reporting slow business throughout the year, has made some important sales during the past two weeks. Another firm sold a heavy 350-ton bending brake.

Sales reported by the Niles Tool Works for the past fortnight included a 100-ton bushing press, a 90-in. heavy driving-wheel lathe, and a 144-in.x96-in.x32 in. planer. For the same period Pratt & Whitney's report included two 13x30 lathes, two 13x40 lathes, four 16x36 lathes, three 16x60 lathes, one 20x48 lathe, one No. 1 jig borer, one No. 1A jig borer, four No. 2 jig borers, one No. 2 die sinker, one No. 3 die sinker, two No. 3 universal bench millers, two No. 0 Sigourney drills, one 2-spindle Sigourney drill, six No. 12 profilers, four gear shavers, two 7x32-in. bench lathes, two 6-in. vertical shapers, and one 8-in. rotary surface grinder. These sales were widely distributed geographically.

One large dealer stated that the sales for the eight months of the present year have been the best sinc 1921, and this statement was concurred in by others, some viewing the forward propects as better than last year. There are enough general inquiries in prospect to make the fall situation appear to be good, although no large or extraordinary buying is being done. Advance inquiries on the part of the automotive manufacturers would indicate that they view the situation as favorable.

PHILADELPHIA

Purchase of additional shop equipment for the Broad Street subway, including a sizable list of Monarch Lathes, costing upward of $21,000, featured the machinery and machine tool business in Philadelphia last week. The contract virtually completes the shop furnishing of the new city-owned subway, which will begin operation September 1.

The Bethlehem Steel Co. also entered the Philadelphia market with some purchases during the last two weeks, and firms producing mining machinery reported some sales which lifted the situation above the summer dullness which settled over it some three weeks ago. Some sales to the automotive industry, and some buying of building equipment by firms seeking material for replacements in industrial buildings, also were noticeable trends in the Philadelphia area.

The inquiries received during the last two weeks have borne hopeful indications of early orders Manufacturers of gears reported a continued business from industrial concern ir a well scattered area.

Railroad buying has been very small. The aircraft industry has developed nothing of outstanding importance in this market although leaders of the industry are watching that new field with much interest. Dealers in tools for woodworking machinery reported a dull season. The purchases by the steel companies were a hopeful sign of favorable basic industrial conditions. Most of the manufacturers look for an active fall.

CHICAGO

Business in machine tools has fallen off to a slight extent during the last week. The recession, however, was not unexpected by the trade. As a matter of fact, several machinery men expressed themselves as agreeably surprised that it should have been maintained for so long on such a high level as it reached in July and the early part of August. The outlook for September business is generally said to be good, this view being founded on the number and character of inquiries being received. At the present time, general industry and machine shop plants are being depended on to furnish the preponderance of orders, buying on the part of farm implement and tractor builders having gradually diminished in volume. No new developments in railroad requirements for shop equipment have been reported. Manufacturers of wood working machinery say that there has been a decline in trade during August, but are looking forward to a resumption of activity in the near future. The used tool market is sluggish, but dealers in this line are optimistic with reference to fall business.

INDIANAPOLIS

While the demand here for machinery and machine tools is seasonably light, the outlook is very promising and the trade does not appear discouraged. It is very likely that August will be somewhat better than the same month last year, but there could be more business. The selling agents are making allowances for vacations and predict the first of September will see a considerable toning up of the market.

Sales of machinery to the lumber manufacturing industry have been none too heavy, but have held up well and the prospects for fall are brighter than last year. Already inquiries for some big equipment are being received and indications are that purchases will be made.

In speaking of the present business, leaders of the trade remark on the wide geographical area it covers. Buyers seem to be purchasing only their absolute requirements, but the sales are coming from a wide radius. Inquiries are more numerous than they were during July, another encouraging feature for next month.

It is predicted also that the automobile and railroad buyers will come to life. There are indications pointing to this now. Just now some of the roads are increasing the number of their machine shop employees and are getting their motive equipment in shape for the heavy fall business.

Business with the agricultural implement, truck manufacturers and tractor makers is a rather bright spot in the local situation. The implement demand has increased during the last month as the factories get ready for winter production, which promises to be heavier this year than last fall. Sale of special equipment to body plants also has been good all during the summer months.

CINCINNATI

In the past week the demand for machine tools has been very fair, report the majority of the manufacturers in the Cincinnati district. A great many state that business has held up surprisingly well through August, even beyond expectancy. "Business is fairly active and the outlook seems good," stated one manufacturer. "The week's business was very good and an increased number of prospects were developed," said a second. "Business is holding up well for the season and fall prospects seem bright," reported a third. "The past week's business has been very good, with some increase over the previous one, and we look forward to a good volume in the fall," stated a fourth.

It is said by selling agents that the market in local and adjacent territory is improving. This branch of the trade reports some gain in the past week and expresses the feeling that the market will liven up in the fall.

In the week an increased amount of business came from the automotive field, and while the orders were not large, being principally confined to single tools and replacements, there is a feeling that this industry is about to buy in a larger way. The greater part of the week's business came from general machinists and miscellaneous

users, located in all sections of the country, who bought a well-diversified line of single tools and replacements.

An encouraging feature of the week was the increased number of inquiries that came from automobile manufacturers. The major portion of the week's inquiries came from general machinists and miscellaneous users, located in all sections of the country, whose requirements were single tools and replacements.

BUFFALO

Machine tool dealers in Buffalo are preparing to emerge from the business doldrums of the vacation season. While this season has been better in many respects than vacation seasons in recent years, it was still far from producing normal business. It would seem that more executives took vacations in August than in July and most reports indicate that business of July was better than August will be.

The electrical equipment trade seems slightly under that of the machine tool trade. The demand for contractors' equipment has been fairly good although the season for buying road-building equipment is well past. There is considerable other construction going on in this vicinity.

CLEVELAND

A noticeable improvement has developed in the local machine tool industry during the past fortnight. Sales are reported as being better than at any time during the summer months. Sales resistance seems to be lessening. Closing of several orders that were deferred for a time has caused an optimistic feeling to permeate among the trade. There is general feeling that sales will pick up gradually during the next few weeks and that a continued improvement can be expected during the fall months.

The automobile industry was the largest purchaser of tools. General Motors, Graham-Paige and Oakland have placed good sized orders among the local manufacturers. Inquiries are increasing in number. General industrialists and the automobile accessory lines have a number of large lists out for quotations.

The brightest spot in the industry is the automatic line which will probably have one of its biggest years. One of the largest producers has enough business on hand to keep its production force busy until December first.

Increased activity is also noted in the punch and shear and planer division.

DETROIT

Business in the machinery trade is much better here this week than it has been for some weeks and a great deal better than dealers had expected at this season of the year. Many fairly good sized orders have been received, inquiries are increasing in number and in importance, and the general trend of the business is highly gratifying.

Production in the Ford plants has jumped to 4,500 and is still increasing rapidly with predictions that it will reach 6,000 soon. This necessitates considerable purchasing of equipment of course. Studebaker, Chrysler, Oakland, Pontiac, Chevrolet and many others are active. The body plants are doing some buying and are making plans for new production.

The new experimental research plant and the grey iron plant of Chevrolet in Saginaw is causing the expenditure of large sums of money and promises to become an importmant part of the Chevrolet organization.

The Hupp Motor Car Co. is building a new factory structure at a cost of more than $1,500,000. Extensions are still being made to the Oakland group at Pontiac on a large scale.

Automobile manufacturers are confident that this will be the biggest year in the history of the industry. If the latter half of 1928 comes up to expectations the year will be a record breaker, and if it falls considerably below, the year will still have been a very profitable one. General Motors sold nearly 32 per cent more cars in July of this year than in the corresponding month last year.

The builders of refrigeration machines here are doing well and are making numerous expansions. Other industries are also doing some buying, but the overwhelming majority of purchases comes, as always, from the automotive and associated industries, all of which are in an excellent state of prosperity. Employment continues to grow rapidly in spite of the fact that it had already reached new high levels here some time ago. The Ford plants alone here are employing 120,000 men, considerably more than were employed when the manufacture of the old car was at its height.

Manufacturers of motor accessories and parts have experienced better business this year than ever before in their histories.

MILWAUKEE

There has been some degree of let-down in the demand for metal-working equipment, in contrast with the relatively brisk state of business during July and early August, but inquiry is still active and there is every reason to believe that action will be taken soon in preparation for the fall and winter production programs of users. The automobile industry, which has been a more important buyer recently than earlier in the year, appears to have satisfied its current needs, although Ford and General Motors units are still in the market. Demand from the motor car factories still runs far ahead of a year ago.

After a period of several weeks during which a number of major plant extension enterprises came to light, the state of industrial construction at present seems rather quiet, so far as this market is concerned. Local industries, however, are doing considerable buying, both for replacements, and to round out equipment to take advantage of all available floor space, thus obviating the necessity of new construction for the time being. Local conditions in the foundry and machine shop trades are well illustrated by the fact that the shortage of skilled labor is as acute as ever. Official reports gave the number employed in forty-four shops regularly reporting at 2,000 more than a year ago on Aug. 1.

Occasionally an order comes from a railroad, but this class of business represents only a bare improvement over past months. No decision has been announced relative to the proposed liberal enlargement of the Chicago, Milwaukee, St. Paul & Pacific's large locomotive and car repair shops in Milwaukee.

Export sales are reported as moderate by local machinery manufacturers. Foreign demand, while not brisk, has been fair to good all year.

Factory Employment Index Smaller

The index of factory employment, which, however, does not include some of the newer industries, was slightly smaller during the first half of 1928 than during the corresponding period of 1927, according to the United States Department of Commerce, thus continuing the movement shown in almost every year since 1919. There was, however, unusual stability from month to month. For the first time since 1923, employment in June was higher than in May. The general downward tendency in factory employment is not an indication of lack of demand for factory products, but reflects the increasing efficiency of industry by which larger quantities of goods can be produced per worker. The extent of this advance in efficiency is evident from calculations of the Department of Commerce, which show that in manufacturing, the output per worker averaged about 43 per cent higher in 1927 than in 1919. A large proportion, possibly the great majority, of the employees who have left factories have gone into other occupations, notably into distribution, into various forms of personal service, and into certain branches of transportation. The immense increase in the use of automobiles has caused the employment of hundreds of thousands in connection with their sale, repair or operation.

Oil Burner Manufacturers Hold Exposition

The oil heating equipment industry's first exposition opened Monday, Aug. 27, at the John Wanamaker New York store, under the auspices of Oil Heating Institute. Nine oil burner manufacturers are taking part in this first demonstration to the general public of the remarkable strides which the oil heating equipment industry has made within the space of a few years. The list of oil burners on display includes: A.B.C., Caloroil, Electrol, Marr, Hart-Preferred, Petrol, Quiet May, Timken and Super Heater. Leod D. Becker, Managing Director of Oil Heating Institute, announced that during the three weeks of the exposition several public talks and discussions would be given.

German Company Organized to Develop Brazil

The German Peruvian Co. has been organized in Berlin to develop unsettled portions of Western Brazil. As its first project, the new company will construct a railroad connecting the Amazon terminal of the North German Lloyd shipping lines with the west coast of South America, and extensive tracts of land along the route have been acquired. The construction of the new road will be done entirely by German engineers and with German materials.

The proposed line runs through country which is climatically suited to European settlers, and is said to be well suited for agriculture. There are also valuable mining districts, as yet only partially developed. It is said that New York capitalists are furnishing most of the money for the project.

H. C. Busch Retires

H. C. Busch, who has been president of the Cisco Machine Tool Co. since its inception, has retired as president and has been succeeded by Ralph B. Busch, vice-president. Mr. Busch was also president of the Cincinnati Iron & Steel Co. which consolidated with Jos. T. Ryerson & Sons, Inc., several years ago. He has been gradually withdrawing as the active head of several other large corporations in order to devote more time to travel and leisure. Ralph B. Busch joined the Cisco organization about seven years ago, and is widely known in the machine tool industry.

Safety Congress to Discuss Industrial Accidents

The seventeenth annual safety congress of the National Safety Council, dedicated to the presentation of ways and means of reducing the annual loss of lives, limbs and property occasioned through unnecessary and preventable accidents, will be held in New York City, October 1 to 5, and the following hotels have been selected as headquarters: The Pennsylvania, Waldorf-Astoria, McAlpin, Martinique and Commodore.

Approximately 95,600 men, women and children met death during 1927 in preventable accidents on the streets and highways in other public places, in their homes and in industry. It is the purpose of this congress to demonstrate that these accidents are within human control.

The council maintains a staff of 83 employees who devote all their time to promoting the safety movement. More than a thousand committeemen, hundreds of exhibitors and scores of other workers have contributed to the forthcoming congress.

Obituaries

J. B. FORD, Portland, Ind., engaged for years with his son A. B. Ford in the Standard Supply Company, doing special machine work, died recently at his home in Muncie, Ind. Mr. Ford was 69 years old, and had been manager of several machinery plants during his life.

Personals

G. E. RANDLES, president of the Foote-Burt Co. of Cleveland, has just returned from a two months trip to Europe.

B. JOSEPH RIORDAN has severed his connection with Leland & Company and is now state representative for the Cadillac Machinery Company of Detroit.

F. L. BILLSBOROW has taken charge of the sale of presses for the Cadillac Machinery Company. He was formerly with the Chrysler corporation.

J. WALLACE CARREL, vice-president and general manager of the Lodge & Shipley Machine Tool Co., Cincinnati, sailed for Europe August 28 on the *America*.

CHARLES J. ARTHUR was recently appointed to the Philadelphia office of the Wagner Electric Corporation, as salesman. Mr. Arthur formerly was sales engineer for the A. R. Amos, Jr., Co., of Philadelphia.

JOHN C. WORTHINGTON has joined the staff of Black & Bigelow, Inc., air transport engineers, New York. Mr. Bigelow's duties will be the inspection of airplanes, selection of operating bases, and other engineering duties.

SUMNER SIMPSON, president of the Raybestos company, is planning the purchase of an airplane to convey him to and from the company plants in Bridgeport, Conn., and Charleston, S. C. A trip by rail requires 20 hours, while he expects to cover the distance in about 5 hours by air.

WILLIAM R. CONDON has been appointed manager of the Des Moines, Iowa, office of the Crane company, it was announced recently, following the transfer of C. W. Owens to the Chicago head offices. Mr. Condon comes from Terre Haute, where he has been sales manager for the past 15 years.

A. S. GOULD has been elected secretary of the Oster Manufacturing Co., Cleveland. Mr. Gould has been sales manager of the company for the past ten years. At the same meeting of stockholders and directors, R. B. Tewksbury was re-elected president and Roger Tewksbury, formerly secretary, was elected vice-president and treasurer.

ARNOLD HUSTON, director of personnel and one of the pioneers of the Delco-Remy Corporation, Anderson, Ind., has been advanced to superintendent of plant 8. Charles F. Dye is to succeed Mr. Huston as director of personnel. William O. Nelson has been promoted from the sales office to the position of assistant to C. E. Wilson, president of the company, and succeeds Mr. Dye. Clarence Kellar has been named as assistant superintendent of plant 8.

Business Items

The Porter-Cable Machine Co. recently received an order for sixteen high speed production lathes for use in Poland. The machines are to be used for high production work on small or medium sized metal parts.

Work has been started on the construction of a $300,000 addition to the plant of the United States Slicing Machine Company at LaPorte, Ind. The addition will permit a 40 per cent increase in production, company officials say.

The Roesch Enamel Range Co., St. Louis, has purchased a factory building in which a complete line of ranges and stoves will be manufactured. The company will continue to manufacture its line and maintain general offices at its Belleville, Ill., plant.

The Chandeysson Electric Co. of St. Louis, manufacturing plating generators, is erecting a one-story addition of 5,000 square feet, representing an investment of $50,000, and employing twenty additional workers. Plans are being prepared for another $65,000 addition in the fall.

Activity has been resumed at the marine machine shops of the William Cramp & Sons Ship and Engine Building Co., Philadelphia. More than $2,000,000 of the inventory of the De La Vergne Machine Co., a subsidiary company, will be completely installed in the Cramp shops by November.

Machinery is being moved from other buildings of the Delco-Remy factory at Anderson, Ind., into the new plant 8 building on Noble Street, which recently was finished. A new high peak in number of workers recently was reached when it was learned that 8,801 persons were on the payroll of the corporation.

The Hayes Manufacturing Co., Galva, Ill., has taken over the patent rights, rights to manufacture and patterns of the Meadows company, Bloomington, Ill., line of portable, bucket and blower elevators, and will continue production at the Galva plant. The Meadows company will confine its activities to the manufacture of washing machines.

Reports from San Francisco indicate that negotiations have been completed for the acquisition of the Western Harvester Co. by the Caterpillar Co. The Caterpillar Co. had a working capital of more than $13,100,000, and a surplus of $14,150,000 at the close of the last year. Following reports of the merger the company stock reached a new high record on the New York curb market.

The Canadian National Railways is to be in the market with a substantial equipment order, according to a statement given to the press by Sir Henry Thornton, president and chairman. He stated also that the success of the Diesel electric passenger cars on the company's lines might lead to an increase in their use. It was not announced how the purchase would be financed, but the forthcoming order is variously estimated at between $10,000,000 and $15,000,000.

The following item is a correction of a previous one which appeared on page 260g of the August 9 issue. The Axelson Machine Co. has purchased the tangible assets of Frank L. Odenbreit, Inc., but has assumed none of the liabilities nor any of the contracts of that company. The Axelson company will manufacture an aviation engine, after the design of that which has been called the Floco engine, in the lathe and tool division of their own plant. Production figures are as yet entirely indefinite.

The Maryland Drydock Co. submitted the lowest bid for the reconditioning of eight Shipping Board vessels from steam to Diesel drive under the board's $25,000,000 program. Other bids were received from the Bethlehem Shipbuilding Corporation of New York, the Federal Shipbuilding Co. of Kearny, N. J., the Morse Drydock and Repair Co. of New York, the Newport News Shipbuilding and Drydock Co., the Sun Shipbuilding and Drydock Co. of Chester, Pa., the Todd Shipyards Corporation of New York, and the Boston and New York Navy Yards.

Forthcoming Meetings

Canada's Steel and Power Show. Second annual show to be held at the University of Toronto Arena, Sept. 4-7. Secretary, Campbell Bradshaw, 24 Front St., Toronto, Ontario.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

Machine Shop Practice Division, American Society of Mechanical Engineers. National meeting, Cincinnati, Sept. 24-26. Part of sessions to be on steamer "Cincinnati." Secretary, Carlos de Zafra, 29 W. 39th St., New York City.

National Safety Council. Seventeenth annual safety congress to be held in New York, October 1-5. W. H. Cameron, managing director, 108 E. Ohio St., Chicago.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Welding Society. Fall meeting and exposition, Exhibition Hall of Commercial Museum, Philadelphia, Pa., Oct. 8-12, in conjunction with "National Metals Exposition" of the American Society for Steel Treating. Miss M. M. Kelly, secretary, 29 West 39th St., New York City.

Institute of Metals, Division of American Institute of Mining and Metallurgical Engineers. Annual fall meeting during National Metal Week, Oct. 8-12, Benjamin Franklin Hotel, Philadelphia. W. M. Corse, secretary, 810 18th St., N. W., Washington, D. C.

American Gear Manufacturers Association. Semi-annual meeting, Statler Hotel, Buffalo, N. Y., Oct. 11-13. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

Society of Industrial Engineers. Fifteenth annual convention, Rochester, N. Y., October 17-19, in conjunction with the Industrial Management Council of the Rochester Chamber of Commerce. George C. Dent, executive secretary, 205 Wacker Drive, Chicago.

National Manufacturers' Association. Combined assembly with the National Industrial Council in New York City, October 22-24. George S. Doudinot, secretary, 11 W. 42nd St., New York City.

American Management Association. Autumn convention, Palmer House, Chicago, Nov. 13-15. W. J. Donald, managing director, 20 Vesey St., New York City.

Iron and Steel Division, American Society of Mechanical Engineers. Second national meeting, Chicago, November 14-15. Thomas Wilson, chairman of Chicago local section host, 7 S. Dearborn St., Chicago.

The Weekly Price Guide

Rise and Fall of the Market

ALL classes of steel are moving to consumers in fairly large volume. In the West, pig-iron buying is particularly active. Prices of both iron and steel tend upward, with the possible exception of black and galvanized sheets at Pittsburgh. Coke rose 50@75c. per ton at Connellsville during the week. Non-ferrous metals continue firm as to price, with advances over the Aug. 17 levels reported in lead at St. Louis, also in antimony and zinc sheets at New York warehouses.

(All prices as of Aug. 24, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$19.69
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	15.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.76
Virginia No. 2	27.17
Basic	19.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4 50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.25	3.90*
No. 12	2.15@2.25	3.40	3.30	3.95*
No. 14	2.25@2.35	3.45	3.35	4.00*
No. 16	2.35@2.45	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.40@2.45	3.60	3.20	4.00
No. 22	2.55@2.60	3.75	3.35	4.15
No. 24	2.60@2.65	3.80	3.40	4.20
No. 26	2.70@2.75	3.90	3.50	4.30
No. 28	2.85@2.90	4.05	3.65	4.45
Galvanized				
No. 10	2.70@2.90	3.95	3.55	4.25
Nos. 12 to 14	2.80@3.00	4.05	3.65	4.35
No. 16	2.90@3.10	4.15	3.75	4.45
No. 18	3.05@3.25	4.30	3.90	4.60
No. 20	3.20@3.40	4.45	4.10	4.75
No. 22	3.25@3.45	4.50	4.15	4.80
No. 24	3.40@3.60	4.65	4.25	4.95
No. 26	3.65@3.85	4.90	4.50	5.20
No. 28	3.90@4.10	5.15	4.75	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.27½	1.9	1.61	.145
½	.37	2.375	2.067	.154
⅝	.58½	2.875	2.469	.203
¾	.76½	3.5	3.068	.216
⅞	.92	4.0	3.548	.226
1	1.09	4.5	4.026	.237
1¼	1.27	5.0	4.506	.247
1½	1.48	5.563	5.047	.258
2	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—Price per Foot: ⅛	¼	⅜	½	¾	1	1⅛	1¼
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049″	18	.17	.18	.19	.20	.21	.23	.25	
.065″	16	.19	.20	.21	.22	.23	.25	.27	
.083″	14	.20	.22	.23	.24	.25	.27	.29	
.095″	13	.21	.23	.25	.26	.27	.29	.31	
.109″	12	.22	.24	.26	.27	.28	.30	.32	
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33	
.134″	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ⅜@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, 3/32, 8.35c.; 1/8, 7.85c.; 5/32 to 1/4 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.50
Tin, Straits, pigs, New York			51.00
Lead, pigs, E. St. Louis	6.15	New York	7.75
Zinc, slabs, E. St. Louis	6.25	New York	7.75

	New York	Cleveland	Chicago
Antimony, slabs	13.00	13.00	14.25
Copper sheets, base	23.50	23.50	23.50
Copper wire, base	20.12½	19.62½	16.75*
Copper bars, base	22.00	22.00	22.50
Copper tubing, base	25.00	25.00	25.00
Brass sheets, high, base	19.25	19.25	19.25
Brass tubing, high, base	24.12½	24.12½	24.12½
Brass rods, high, base	17.00	17.00	17.00
Brass wire, high, base	19.75	19.75	19.75

*At mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	24.30	24.30
Zinc sheets (casks).....	11.00	11.00	9.61
Solder (strictly).....	32.25	30.75	31@34

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade.....	67.75
Commercial genuine, intermediate grade.....	53.00
Anti-friction metal, general service.....	31.50
No. 4 babbitt (f.o.b.).....	12.25

Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:

Ingots.....	35.00	Electrolytic.. 37.00	Shot..... 36.00

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base).....	52.00
Cold rolled nickel sheet (base).....	60.00
Hot rolled rods, Grade "A" (base).....	45.00
Cold drawn rods, Grade "A" (base).....	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot.....	28.00	Hot rolled rods (base)...	35.00
Blocks.....	28.00	Cold drawn rods (base)..	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f. o. b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper.....	12.75 @13.00	12.00	11.75@12.25
Copper, heavy, and wire..	12.00 @12.75	11.25	11.25@11.75
Copper, light, and bottoms	10.62½@11.12½	9.75	10.00@10.50
Heavy lead.....	5.00 @ 5.12½	5.25	4.50@ 5.00
Tea lead.....	3.50 @ 3.75	3.75	3.50@ 4.00
Brass, heavy, yellow.....	7.25 @ 7.50	7.75	7.25@ 7.75
Brass, heavy, red.....	9.75 @10.25	10.00	9.50@ 9.75
Brass, light.....	5.50 @ 6.00	6.25	6.25@ 6.75
No. 1 yellow rod turnings.	7.75 @ 8.25	7.75	7.50@ 8.00
Zinc.....	3.25 @ 3.50	3.25	2.87½@3.37½

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20.....	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box				
IC,	14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.....	.15½	38.00 per M	.17
Sal soda, per lb.....	.02	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.105	105	.103
Cutting oil, about 25% lard, in 5 gal. cans, per gal....	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.:			
Medium grade.....	30–10%	30–10%	35%
Heavy grade.....	25–5%	30–5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.....	$0.0325	$0.0325	$0.0324
Cold drawn shafting....	per lb.....	.034	.034	.04
Brass rods.....	per lb.....	.17	.17	.16
Solder (½ and ½).....	per lb.....	.3225	.31	.40
Cotton waste, white....	per lb.....	.10@.13½	.10@.13½	.10@.13½
Emery disks, cloth, No. 1, 6-in. dia.....	per 100...	3.10	3.10	3.10
Lard cutting oil.....	per gal...	.65	.65	.65
Machine oil.....	per gal...	.30	.30	.27
Belting, leather, medium.....	off list....	30–10%	30–10%	40–5%
Machine bolts, up to 1x30 in., full kegs....	off list....	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper.....	$5.40	$5.56	$5.13
*Emery paper.....	10.71	11.90	10.71
†Emery cloth.....	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper.....	1.29	1.45	1.32
Cloth.....	3.10	3.55	3.05
Fire clay, per 100 lb. bag.....	1.00	.75	.75

Coke, prompt furnace, per net ton...	Connellsville,	2.75@3.00
Coke, prompt foundry, per net ton...	Connellsville,	4.00@4.50
White lead, dry or in oil...	100 lb. kegs....	New York, 13.25
Red lead, dry.....	100 lb. kegs....	New York, 13.25
Red lead, in oil.....	100 lb. kegs....	New York, 14.75

*4½ reams and under. †Less than 2 reams.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.....	55%
Larger up to 1 x 30-in.....	50%
1¼ and 1½ in. dia.....	35%
Carriage bolts:	
Up to ¾ x 6-in.....	55%
Larger sizes.....	50%
Coach and lag screws:	
Up to ¾ x 6-in.....	55%
Larger sizes.....	50%
Tap bolts, hexagonal heads.....	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.....	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.....	55%
Semi-finished, hexagonal, tapped, in packages, all sizes.....	40%
Case hardened, hexagonal, tapped, in packages, all sizes.....	30%
Washers: Deduct from list, per 100 lb.....	$3.50*
Rivets, button and cone head:	
Small, including ½-in. dia.....	50–10%
Large (base) per 100 lb. net.....	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Calif., San Diego—Bureau of Yards & Docks, Navy Dept., Washington, D. C.—10 ton electric bridge crane at Naval Operating Base (Air Station) here.

Mich., Detroit—Knight Screw Products Co., 6510 Epworth Blvd., W. C. Knight, Purch. Agt.—machine shop equipment for proposed plant addition.

Mich., Flint—Chevrolet Motor Car Co.—assembly line equipment and conveyors for proposed 2 story, 200 x 240 and 50 x 170 ft. auto assembly plant.

Opportunities for Future Business

Calif., Emeryville—Amateur Screw Products Co., 1265 67th St., plans addition to factory. Estimated cost $40,000.

Calif., San Francisco—City and County of San Francisco, plan addition to junior high school including machine shops, etc. at Bay, Francisco, Powell and Stockton Sts. Estimated cost $400,000. S. Heiman, 57 Post St., Archt.

Conn., Bridgeport—Bridgeport Hardware Mfg. Co., 461 Iranistan Ave., plans the construction of a 2 story, 45 x 102 ft. plant on Washburn St. Estimated cost $40,000. Private plans.

Conn., Fairfield — U. S. Aluminum Co., Post Rd., awarded contract for a 1 and 2 story, 220 x 470 and 65 x 140 ft. factory and service building, etc. Estimated cost $275,000.

Conn., Stamford—A. Spelke, 480 Main St., is receiving bids for a 1 story, 115 x 140 ft. garage and service station on Luther St. Estimated cost $70,000. F. Urso, 432 Main St., Archt.

Ill., Chicago—W. H. Hutchinson & Son, 2101 Walnut St., manufacturers of bottling machinery, plans the construction of a 2 story factory on North Cicero Ave. Estimated cost $250,000.

Ill., Chicago—International Harvester Co., 666 South Michigan Ave., awarded contract for a 1 story, 180 x 510 ft. shop at 2600 West 31st St. Estimated cost $170,000.

Ill., Chicago—O. D. Jennings & Co., 4329 Lake St., manufacturers of coin machines, plans the construction of addition to factory at 4309 West Lake St. Estimated cost $125,000.

Ill., Chicago—Victor Mfg. & Gasket Co., 5750 West Roosevelt Rd., awarded general contract for a 4 story addition to present 3 story plant. Estimated cost $150,000. Noted Aug. 16.

Ill., Cicero — Western Electric Co., 11 South La Salle St., Chicago, is having plans prepared for a non-ferrous metal mill here. Estimated cost $3,000,000.

Ind., Indianapolis—Federal Foundry Co., 502 South Harris St., awarded contract for additions and improvements to foundry including machine and carpenter shops, etc. Estimated cost $40,000.

La., Shreveport—Adolphus Inc., c/o C. W. King, Giddens-Lane Bldg., Archt., awarded contract for a 4 story garage at 520 Edwards St. Estimated cost $75,000.

Mass., Brighton (Boston P. O.)—H. P. Hood & Sons, 494 Rutherford Ave., Charleston, is receiving bids for the construction of a 1 story, 75 x 140 ft. plant at Etna and North Beacon Sts. here. Estimated cost $40,000. Private plans.

Mass., Cambridge (Boston P. O.)—Crandall Engineering Co., East Boston, awarded contract for the construction of a 2 story plant on Kendall Sq. here. Estimated cost $40,000.

Mass., Chelsea (Boston P. O.)—Beaudette Mfg. Co., Crescent Ave., manufacturers of loud speakers, awarded contract for a 2 story addition to factory. Noted July 26.

Mass., Lynn — Lynn Ornamental Iron Works, 966 Broad St., awarded contract for a 1 story shop on Broad St. Noted June 14.

Mass., Natick—F. Kirby, Summer St., is receiving bids for a 1 story, 70 x 110 ft. garage and repair shop. Estimated cost $50,000. E. F. Albridge, 761 Dudley St., Dorchester, Archt. Noted Aug. 23.

Mich., Detroit—Hupp Motor Car Co., 3641 East Milwaukee St., awarded contract for an 8 story engineering, shipping and storage building including loading docks, etc. Estimated cost $1,500,000.

Mich., Ferndale—Steel & Tubes Inc., W. J. Sampson, Jr., Pres., 224 East 131st St., Cleveland, O., is receiving bids for a 1 story, 210 x 500 ft. factory here. Estimated cost $250,000. Sessions Engineering Co., 228 North La Salle St., Chicago, Ill., Engr.

Mich., Highland Park (Detroit P. O.)—Chrysler Motor Car Co., Massachusetts Ave., awarded contract for a 1 story, 80 x 540 ft. addition to present two story plant for storage of motor cars and parts on Oakland Ave. Estimated cost $100,000.

Minn., Dassel—Skold Motor Co., awarded contract for a 1 story, 60 x 130 ft. repair and service garage.

Minn., Fairbault—F. R. Kummer, will soon receive bids for the construction of a 1 story, 66 x 170 ft. garage. L. C. Pinault, St. Marys' Bldg., St. Cloud, Archt.

Minn., Minneapolis—S. J. Groves & Sons Co., highway contractors, will build a 1 and 2 story, 118 x 140 ft. garage at Lyndale Ave. N., and Lakeside Ave. Private plans.

Mo., Bridgeton—Bd. of Public Service, St. Louis, voted $2,000,000 bonds for the acquisition of Lambert-St. Louis Flying field including administration and air service buildings, etc. here. B. Russell Shaw Co., 4616 Lindall Blvd., St. Louis, Mo., Consult. Engrs. Noted July 5.

Neb., Omaha—Nebraska Buick Auto Co., L. Huff, V. Pres. and Mgr., awarded contract for the construction of a 1 story, 99 x 136 ft. garage etc. at Fifth Ave. S. and 19th St. Estimated cost $45,000.

N. J., Bayonne — Bayonne Bolt Corp., Trash Ave. and Second St., awarded contract for a 1 story, 50 x 287 ft. factory. Estimated cost $40,000. Noted June 21.

N. J., Kearny—Western Electric Co. Inc., 195 Broadway, New York, N. Y., awarded contract for a 2 story factory here. Estimated cost $75,000.

N. Y., Buffalo—Bliss & McLaviin Inc., Harvey, Ill., plans the construction of a 1 story steel mill here. Estimated cost $1,000,000. Horace Carpenter, Buffalo, Engr.

N. Y., Buffalo—Kittenger Furniture Co., 1893 Elmwood Ave., awarded contract for a 3 story, 60 x 75 ft. addition to factory at 1925 Elmwood Ave. Estimated cost $50,000.

N. Y., Long Island City—Stores Building Inc., 463 7th Ave., New York, will build a garage at 38th St. and 43rd Ave. here. Estimated cost $180,000. Shampan & Shampan, 188 Montague St., Brooklyn, Archts.

N. Y., New York—Bernson Construction Co., R. Bernson, Pres., 1306 Jerome Ave., will build a 4 story, 75 x 98 ft. garage at 329 East 22nd St. Estimated cost $60,000. W. Shary, 41 Union Sq., Archt.

N. Y., New York—Richbask Realty Corp., 534 East 72nd St., plans the construction of a garage at 407 East 61st St. Estimated cost $75,000. W. Shary, 41 Union Sq., Archt.

N. Y., New York—Rockefeller Institute for Medical Research, 66th St. and Ave. A awarded contract for the construction of a garage at 64th St. and Ave A. Estimated cost $250,000.

N. Y., Troy — Behr-Manning Corp., awarded contract for the construction of an abrasive plant including 1 story, 65 x 170 ft. machine shop, etc. Estimated cost $350,000.

N. D., Fargo—Chevrolet Motor Co., T. F. Kinman, Gen. Mgr., plans the construction of a 2 story, 115 x 250 ft. branch plant. Estimated cost $100,000. Private plans.

N. D., Fargo—Northern Reo Co., will build a 2 story, 75 x 100 ft. sales and service station and garage at Front Ave. and Fourth St. S. Estimated cost $45,000. J. E. Rosatti, 117 Broadway, Archt.

N. D., Minot—Melvin Fauchald, will soon receive bids for the construction of a 1 story, 100 x 100 ft. repair and service garage. Estimated cost $45,000. L. Rush, Minot, Archt.

O., Cincinnati—I. Hodesh, Rockdale Ave., will soon award contract for a 9 story garage on Walnut St. Estimated cost $200,000. Rendigs, Panzer & Martin, Southern Ohio Bank Bldg., Archts.

O., Dayton—U. S. Army, War Dept., W. E. Gillmore, plans the construction of a 1 story, 200 x 300 ft. repair shop for general airplane repair at Wright Field. Estimated cost $243,000.

Okla., Tulsa—City, is having plans prepared for the construction of an airport including hangars, mechanical shops, etc. Estimated cost $1,000,000. B. R. Shaw Co., 4616 Lindell Blvd., St. Louis, Mo., Engr.

Ore., Burns—Edward Hines Lumber Co., 2431 South Lincoln St., Chicago, Ill., plans the construction of a saw-mill and lumber plant here.

Ore., Grants Pass—C. A. Winetrout, will build a 2 story, 100 x 100 ft. repair shop and storage building at 5th and 1st Sts. Estimated cost $40,000.

Wis., Milwaukee—Chain Belt Co., 16th St. Viaduct, has work under way on fourth unit of plant, 104 x 150 ft. on 59 acre tract of land.

Wis., Milwaukee — Geuder, Paeschke & Grey Co., St. Paul Ave. and 15th St., awarded contract for the construction of a 1 story, 190 x 405 ft. manufacturing and storage plant, to the Austin Co., Dearborn St., Chicago, Ill.

Wis., Rice Lake—Reckenthaler Bros., awarded contract for a 1 story, 66 x 132 ft. garage. Estimated cost $25,000. Noted July 5.

Ont., Chatham — Bd. of Education, B. Kendrick, Chn., awarded contract for addition to vocational school including four shops, etc. Estimated cost $115,000.

Ont., Oshawa—C. B. Dolphin, Leader Lane, Toronto, will soon receive bids for the construction of a garage on King St. here. Estimated cost $90,000.

Ont., Walkerville—General Motors Co. of Canada, is having plans prepared for a 1 and 2 story extension to motor plant. Estimated cost $500,000. Hutton & Sauter, 6 James St. S., Hamilton, Archts.

Que., Montreal—Pigeon & Drapeau, 2050 Gouin St., plans the construction of a sash and door factory. Estimated cost $125,000.